EXCLUSIVE

LPG UNDERGROUND STORAGE CAPACITY ZOOMS—

as shown in new Journal survey

ANNUAL FEATURE STARTS ON PAGE 85

The OIL AND GAS JOURNAL

PUBLISHED WEEKLY NOVEMBER 28, 1960

RUSSIAN OIL: Not so big a threat as it once appeared

... now that we know more about it. p. 35

There's a crisis coming in fuel-oil sales ▸ 42

Monterey sale to be wrapped up soon ▸ 44

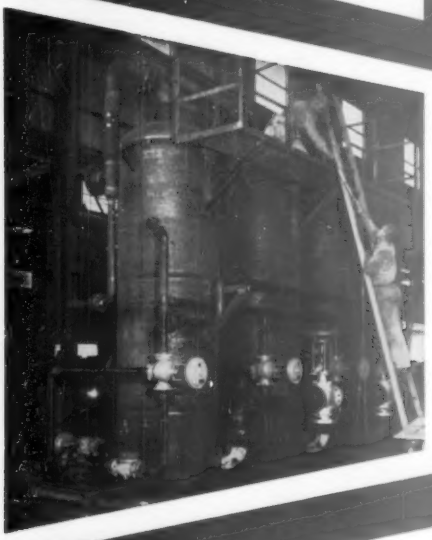
TECHNOLOGY

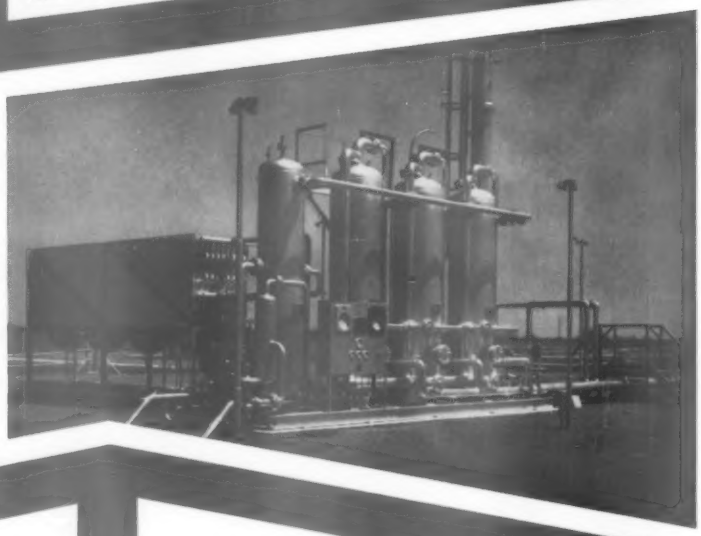
New electric rig is compact, portable, flexible ▸ 60

Lean pipeline gas squeezed dry by extraction plant ▸ 64

SUPERIORITY

FROM START TO FINISH...





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OIL AND GAS JOURNAL
Vol. 58, No. 48

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The Oil and Gas Journal is published weekly by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 3, Okla. Second-Class postage paid at Tulsa, Okla. Copyright 1960 by The Petroleum Publishing Co. United States and foreign rates to the petroleum industry, 1 year $5, 2 years $8, 3 years $10.

TECHNOLOGY—OPERATION

Drilling-Production

New Electric Rig is Compact, Portable 60

By F. R. Mayer

Exeter Drilling Co.'s Rig 3 is now operating as a diesel-electric unit, with improved over-all operating efficiency through: (1) greater portability, (2) faster rigup and teardown, (3) increased drilling rate, and (4) lower maintenance cost. At the same time the rig still retains the flexibility of the split rig.

Oil-Well Pumping—24 67

By Joseph Zaba

Find plunger travel from dynamometer cards.

How to Analyze Your Gas-Lift Wells 72

By Kermit E. Brown and Carlos Canalizo

There is more to putting a well on gas lift than just running some valves on the tubing. An immediate thorough check should be made of the installation, followed by periodic checks of the efficiency of the operation. Here's how to run these checks and what to do to correct any troubles that are found.

Pipelining

Initial Cost Favors Turbine Pipeline Meter 70

By William W. Holt, Jr.

Large-capacity turbine-type meters have a distinct advantage in initial cost over positive-displacement meters. Installation costs for the turbine meter are either about the same or less. Plantation finds the turbine meter is highly accurate and repeatability is excellent.

Pipeline Construction Survey 93

Refining-Processing

New Gas Process Plant Incorporates New Features 64

By J. A. Sutherland, W. M. Hathaway, and P. W. Eatman

The 650-M.M.c.f.d. plant recovers more than 90% of the propane in the inlet gas, generates its own power, and has complete fractionation facilities for handling 316,000 gal. of product per day. Total fuel consumption is less than 1% of the inlet-gas volume and gas-pressure loss through the plant is about 10 psi.

New Technique Contains Explosions 68

A new technique for suppressing explosions, before they become big enough to be destructive, is now commercially available. The new system offers active, rather than passive, protection. The explosion is detected at the instant of its inception. Then within a few thousandths of a second, suppressive steps are taken to literally snuff it out.

Process Costimating—84 80

Processing in refineries outside the U. S. and Canada.

LPG Underground Storage Capacity to Climb 24% 85

By Robert B. Bizal

The Journal's seventh annual LPG-storage-capacity survey shows more than 20 new projects just completed, under way, or planned. These will boost U. S. capacity to more than 60,785,000 bbl. Expansion is in salt cavities as well as mined caverns. The survey lists capacities by states, companies, type of formation, and product. Canada's storage space is growing, too.

Polyurethane Coating Solves Storage Problems 92

This new coating prevents loss of steel from storage tanks through corrosion and halts rust contamination of the fuel itself.

The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Nov. 28, 1960

The 5% wage increase has picked up support:

Atlantic Refining has joined Indiana Standard in making the offer to various unions representing its employes.

The offer: A 5% hike in wages in return for a 2-year contract binding the unions not to negotiate a general pay increase during the period.

The offer is not a pattern yet. Some companies and some unions indicate they don't favor the package.

Executives of other oil companies were caught off guard by the sudden offer. Feeling among several of these is that their operations don't justify a 5% raise even if it assures 2 years of labor peace.

OCAW, the top union involved, also is reportedly cool on the offer and has recommended to its locals that it be turned down in favor of further negotiations. Union goal is at least 18 cents an hour more. The Indiana raise figures out at an average of 15 cents an hour.

▼ ▼ ▼

Major showdown on oil import-control program looms.

There's even talk of a court challenge to authority of Interior Department to make changes in basic structure of the program without a special study and recommendation of OCDM.

Recent hearings revealed two basic questions: Should there be any change in the level of imports? And does there need to be any change in the way quotas are allocated?

The lineup: Producer groups favor new cuts in imports. International companies and marketing groups oppose. Some groups also want quotas based entirely on refinery runs, eliminating allowance for historic importers (p. 48).*

▼ ▼ ▼

Active rotary rigs reached 1,858 last week, second best week of the year. High point so far has been 1,895 operating in the last week of May.

---

*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

Rig activity has been picking up gradually the last 4 weeks. Actually it's a normal, seasonal trend reflecting the decision of operators to complete the year's drilling program. Their income pattern for the year is pretty well set, and the drilling now is designed to take advantage of tax allowances and plow back some of the income into the business.

The immediate outlook is no brighter for earth scientists.

Latest development: Large number of geologists and geophysicists has been "released" by Ohio Oil Co. Number is not known, but all were top hands under 40 years of age.

Ohio says it was overstaffed, even after reorganization which cut out many jobs earlier this year. Company says none was fired for inefficiency. It is trying to find new jobs for as many as possible.

A boom atmosphere pervades Oklahoma's Kingfisher County.

There are 59 active locations in the county, making it one of the most active counties in the country. Out of 84 field wells completed this year, 78 have been producers; and 16 out of 21 wildcats drilled have been successful.

Sleepy Hollow field is attracting new interest to the Kaneb basin of Redwillow County, Nebraska. Pubco Petroleum staked 14 new locations last week and Ohio Oil 4, mostly to the south and west of production.

New locations are staked on a 40-acre pattern, although the Nebraska Oil & Gas Commission has taken under advisement a request for 80-acre spacing.

▼ ▼ ▼

First pipe has been laid on U. S. section of the new Alberta-to-San Francisco gas pipeline system.

Only about 5 miles of 36-in. pipe were involved in the initial pipe laying but it was the kickoff of a mammoth pipelaying operation that will involve from 10 to 12 spreads in the field next spring (p. 40).

India is considering a series of product pipelines that would interlace the country within 5 years.

Top projects being talked include: A 600-mile products line across northern India from Barauni to Delhi with a 40,000-bbl. refinery and terminal at Barauni; a 720-mile crude system from Nahorkatiya to Barauni; a 300-mile crude and products line from Bombay to Bhusaval plus a refinery; and a 120-mile products line from Bombay to Poona (p. 54).

Major new gas reserves have been tapped in Holland.

Royal Dutch-Shell and Jersey Standard in two separate discoveries in northern Netherlands have uncovered reserves of at least 2 trillion cubic feet.

The find ranks as one of the most important in western Europe.

Liquefaction of natural gas may get its first commercial test in Alaska.

Union and Ohio, partners in developing a gas field on the Kenai Peninsula, are looking at the possibility of liquefying the gas and moving it by tanker to Japan and the U. S. West Coast.

Some had thought the idea dead, but just last week Union President Dudley Tower told the San Francisco security men that the two companies are still investigating the idea.

Kenai gas producers also are hunting other markets for their gas besides the Anchorage heating market. Under study is a gas line to Fairbanks.

Underground storage is keeping pace with the bustling LPG business.

Spurred by fast rising demand and new LPG pipelines, storage capacity will climb another 24% to top 60.7 million barrels when new projects now started or planned are completed.

A new Journal survey shows more than 20 new projects are now in the works (p. 85).

▼ ▼ ▼

Mobil is putting new emphasis on service-station area and site selection. Research also is being done in service-station design and materials with the aim of reducing construction costs and increasing consumer appeal.

Mobil reports that in the last 3 years average volume of gasoline sold per station has increased 15%. Company also has broken its domestic gasoline sales records in first 10 months of 1960.

Marketing notes:

Phillips Petroleum has its eye on the women in doubling its outdoor advertising coverage. The advertising is designed to bait the women drivers, and their number is expected to jump from 35 million to 77 million by 1965.

Skelly had the same thing in mind earlier this year when it issued 200,000 specially designed women's credit cards.

Union Oil has mailed out a million permanent credit cards to its customers to replace the temporary cards. Cards only carry the name and code number of the customer. Union hopes to eliminate the huge cost of renewing cards.

Fuel-oil dealers face critical selling job in the next 3 years. That's when a host of oil burners begin to wear out, and it means that the homeowner is more vulnerable to the sales pitch of competitive fuels (p. 42).

Market Memo

Nov. 28, 1960

The products market is undergoing a rolling seasonal adjustment of supply and demand with posted prices holding.

This is featured by lower crude runs to stills and a contraseasonal reduction in gasoline stocks.

Anomaly of market trends is a net improvement for product prices.

This price trend, however, is based on a change in the weather soon and its attendant effect on middle distillates, the current money crop for refiners.

Gulf Coast markets have seen no price change.

Refiners continue to offer gasoline at posted price of 11.25 cents for 92-RON. Buyers continue to show no interest in gasoline at that level.

No. 2 is closely held on the coast for 8.25 cents posted with no indication of discounting and few spot sales reported. Depressed prices on the East Coast likely will continue until colder weather strikes.

In the Midwest, product prices are in good shape with gasoline generally going for 12.25 cents for 91-RON out of the Great Lakes Pipeline. A limited amount of discounting is reported.

No. 1 and No. 2 are not being pushed despite inventories that could become burdensome if winter weather is too long delayed. Posted prices are 10 cents for No. 1 and 9 cents for No. 2.

In Chicago, discounts continue to harass the market. The posted price of 12.625 cents for 92-RON gasoline is unchanged, but offerings are freely available at one-quarter to three-eighths cent off.

No. 1 is posted at 10.25 cents and No. 2 at 9.50 cents and are subject to one-quarter cent discounts.

River markets are inactive.

Occasional spot sales of gasoline for movement up river indicate some price concessions are being made to get the business. But refiners normally active in river markets are reported in good shape. A price range of Gulf Coast low to one-quarter cent off that figure is typical of current gasoline offerings between Arkansas City and West Memphis.

Both No. 1 and No. 2 are awaiting demand but are being held for firmer pricing.

Good Wells Make Good News

A Report on Recent Profit-Increasing "Workover" Treatments

NOVEMBER 28, 1960

"Workover" treatments by Dowell have made many old wells more profitable to their operators. Here are four recent examples showing how Dowell products and services improved wells for operators:

- **Lea County, New Mexico** (Old Oil Well) This well, completed in the Drinkard formation of the Blineberry pool, had lost production completely due to gyp deposits. First, 200 gallons regular acid with surfactant added were spotted on bottom for 24 hours and then pumped out. Next, a 600-gallon solution containing 180 gallons of Versene® 100, water, and a surfactant was spotted on bottom. This solution was allowed to soak for 48 hours, then circulated for 24 hours. After treatment, well flowed 140 bopd.

- **Saskatchewan, Canada** (Old Oil Well) This well, completed into the Mississippian in 1957, was given several acid treatments with no results. Well was temporarily abandoned. Dowell recently suggested Abrasijet* — Dowell's abrasive jetting service — to slot casing and formation. Four slots were cut — two at 4584 and 4585 feet, and two between 4571 and 4575 feet. 12,000 pounds of 20-40 mesh sand were used. Differential pressure across jets was from 3000 to 3500 psi. Well started making 25 bopd. Treatment cost of $1185.00 is expected to pay out quickly. In addition, a valuable well was saved.

- **Gray County, Texas Panhandle** (Old Oil Well) This Panhandle dolomite well had been shot with nitro from 2885 to 3285 feet on initial completion. Subsequent treatments included several acidizing and fracturing jobs. Production had dropped to 7 bopd. Dowell fractured using 16,000 gallons gelled water, 80,000 pounds sand and 5000 pounds salt. Treatment was divided into two equal stages. Salt was injected with 1500 gallons frac oil between stages to act as a temporary plugging material. Injection rate of fracturing fluid was 45 bpm. Pressure was zero during first stage and 300 psi during second. 45 days after treatment, daily production was 42 bopd.

- **Crook County, Wyoming** (Old Oil Well) Production from this well had declined from 200 bopd after fracturing on initial completion early in 1959 to 80-90 bopd just before treatment on August 1, 1960. Pay was the Dakota sand of the Miller Creek pool from 5924 to 5944 feet. Dowell used the "Frac Guide"* to help plan a treatment for this well. A 250-gallon Mud Acid spearhead was followed by Petrojel*. 20,000 gallons gelled lease crude with fluid loss additive carried 20,000 pounds sand. Injection rate was 24 bpm at 1800-2300 psi. Production 30 days after treatment was 480 bopd flowing. Cost of the frac job was paid out in less than 10 days.

Investigate the many services and products offered by Dowell to help you boost profits by making your wells worth more. For detailed information — or for prompt service — dial Dowell. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, France, Germany and the Sahara area. Dowell, Tulsa 1, Oklahoma.

*DOWELL TRADEMARK

Services for the oil industry DOWELL

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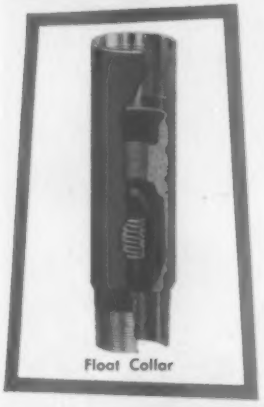

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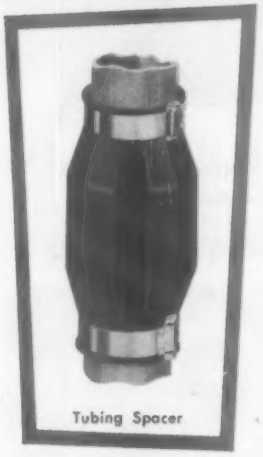

Tubing Spacer

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This unique shoe with cast aluminum nose affords excellent guiding action when running the tubing string. In position, a weighted tripping ball is dropped to seat on the nose and pump pressure (normally 400 psi) causes the retaining pins to shear and drops the nose and ball out of the shoe — leaving a full opening.

Tubing Guide Nose . . . with Full Opening

This tool is an extra short, full opening, version of the Regular Tubing Guide Shoe. It is formed from a steel tube and is available in most tubing sizes. Its rounded nose helps direct the tubing as the string is being run.

Tubing Super Seal Floating Equipment

These compact tools have the *field proven* Halliburton Super Seal Valve to help hold the cement slurry when pumped in place. These valves provide 1¾" opening through the seat. Tools may be equipped with automatic fill-up attachments to allow tubing to fill and reduce running time.

Tubing Spacer

Halliburton Tubing Spacers are used on 2⅞" O.D. tubing in multiple string completions to allow cement to flow evenly around each string, reduce channeling and provide better protection for the string. Made of an 85 durometer rubber, the Spacer is split for easy installation with metal banding.

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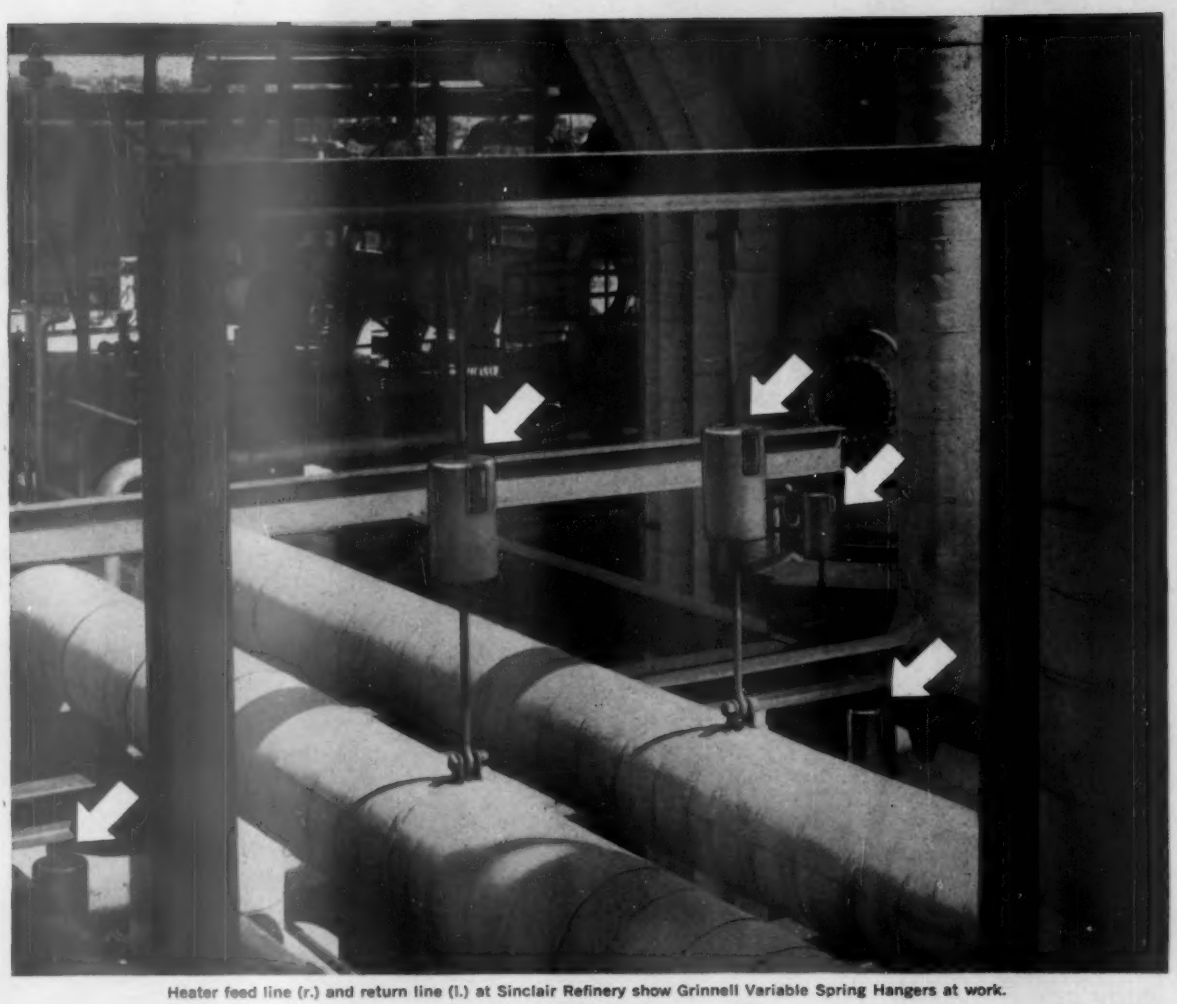

Heater feed line (r.) and return line (l.) at Sinclair Refinery show Grinnell Variable Spring Hangers at work.

Grinnell Hangers support high-temperature pipe lines at Sinclair Refinery

Grinnell Variable Spring Hangers support bottom lines on vacuum still operating at 750°F.

Hot news: Grinnell variable Spring Hangers support pipe lines at Sinclair Refining Company's Marcus Hook, Pa. plant, that operate at temperatures *above 500°F.* Yet these flexible hangers easily accommodate thermal movement in the pipe lines!

Where reactive forces at terminal points must be kept within specified limits, *Grinnell Constant Support Hangers* are recommended. Where pipe lines are subject to vertical movement and restrictive conditions do not require the use of a constant support type, *Grinnell Variable Spring Hangers* are recommended. Where abnormal horizontal movement or vibration in pipe lines must be prevented, *Grinnell Sway Braces* are recommended.

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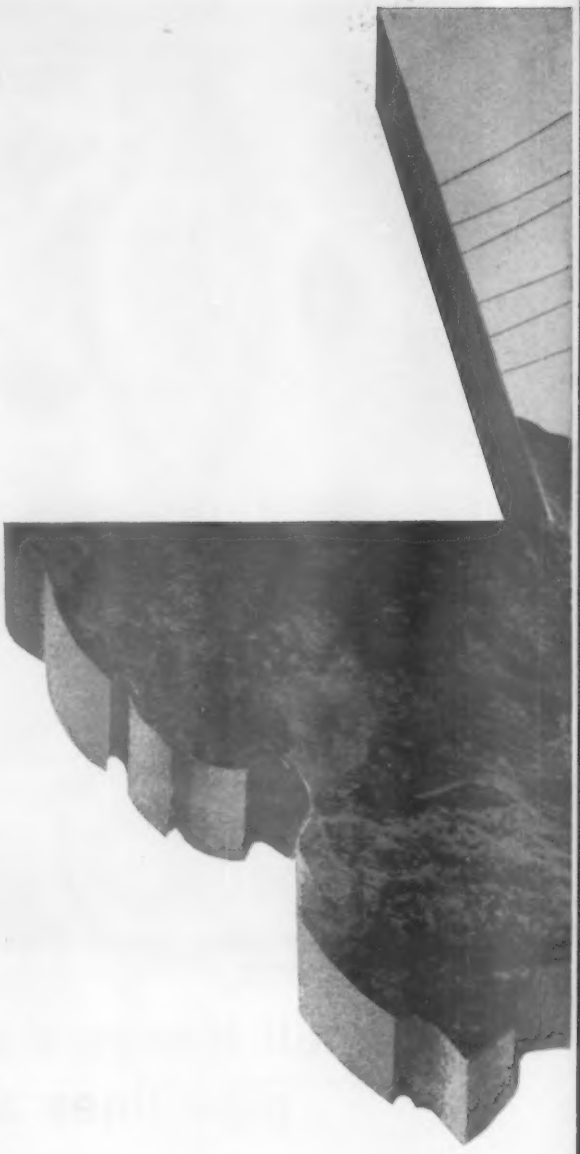
to meet needs of electric utility for huge quantities of natural gas



Pipeline to carry fuel gas from Old Ocean field to four of the steam-electric generating stations of the Texas Electric Service Company power system

Old Ocean Fuel Company, subsidiary of Texas Electric Service Company, has recently completed a gas pipeline which spans the 367 miles between the Old Ocean gas field in Brazoria and Matagorda Counties and the Fort Worth and Graham areas. Natural gas transported in this line will keep four of the great power plants of Texas Electric Service Company's power system humming.

A. O. Smith of Texas supplied 273 miles of 24-inch and approximately 24 miles of 20-inch "Made in Texas" pipe for this project. Since our first shipment of pipe in 1927, A. O. Smith has produced over 50,000 miles of large-diameter pipe. From our Milwaukee and Houston mills comes a dependable supply of pipe for almost every major pipeline project.

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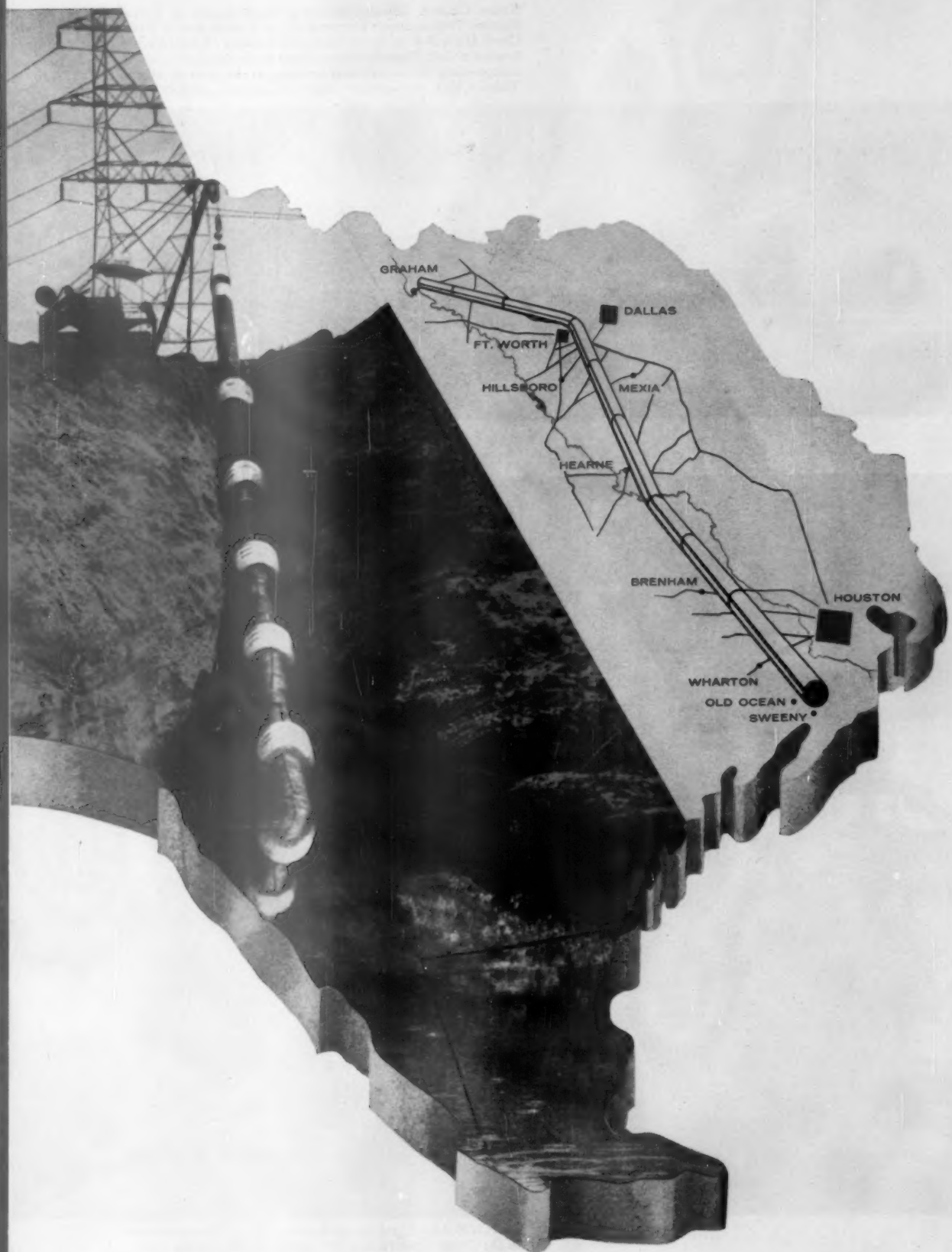
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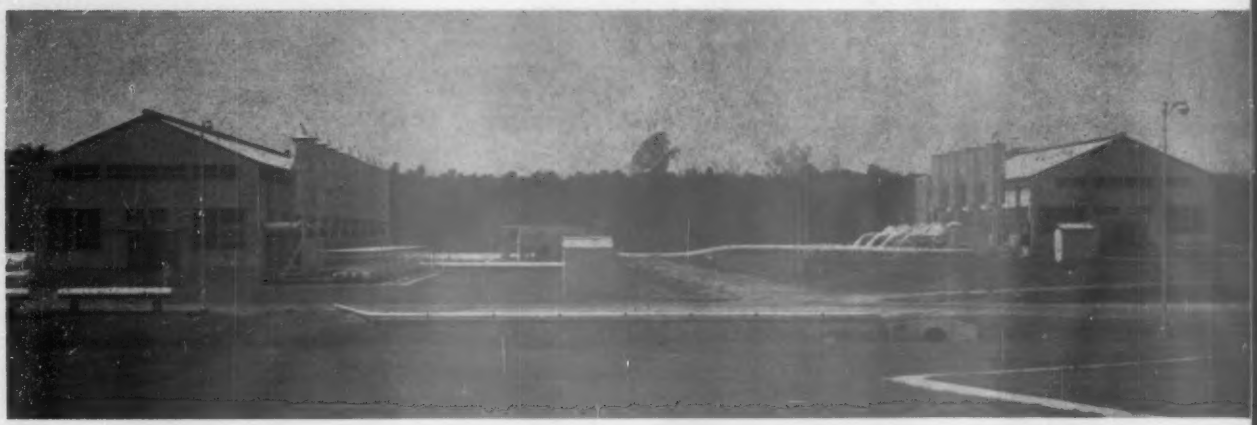
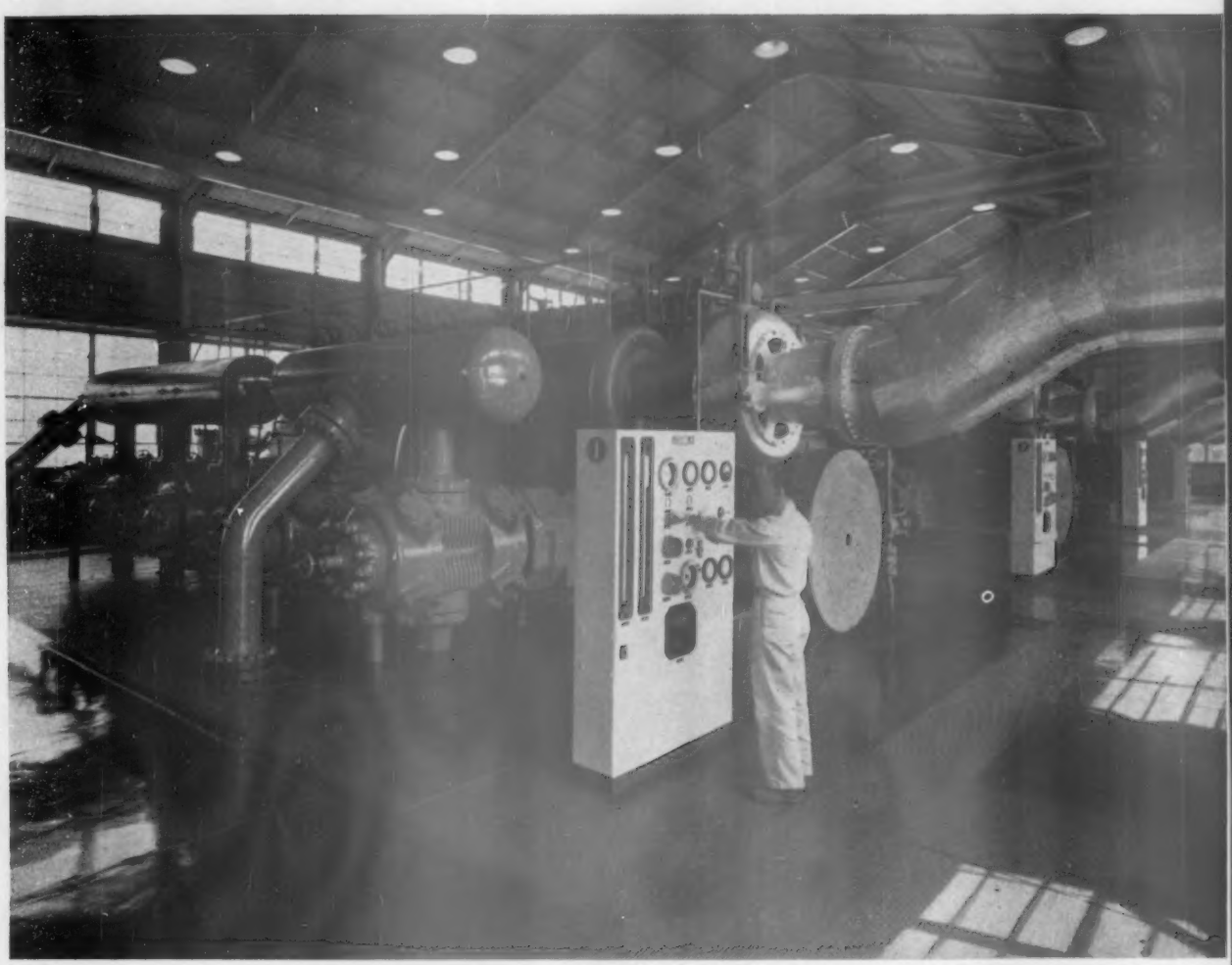
OLD OCEAN
SWEENY

Union Church, Mississippi compressor station of Texas Eastern Transmission Corporation, as it looks today. Nine Clark HBA-8-T turbocharged units totaling 18,450 bhp are housed at left. Four 3400 bhp Clark turbocharged TLA-10 compressors are in adjacent building at the right in photo. Total Clark horsepower now in station – 32,050 bhp.





Four 3400 bhp Clark turbocharged TLA-10 compressors on the Texas Eastern line at Union Church station. Operator is shown at Clark automatic engine starting panel.

"HORSEPOWER TRIPLED, EFFICIENCY VASTLY IMPROVED, MAIN LINE FLEXIBILITY MAINTAINED,"

Reports Texas Eastern on its Union Church Station

In implementing expansion programs for its Texas to New York transmission system, Texas Eastern Transmission Corporation tripled the horsepower of the initial installation at its Union Church, Mississippi compressor station from 10,560 hp to 32,050 hp. In meeting the progressively increasing flow and changing pressure conditions, it was essential to retain line flexibility. By the addition of large reciprocating units in the station it was possible to increase station efficiency by the reduction of installation and operating costs per bhp.

In one of their programs, nine existing Clark HBA-8 compressors were converted to turbocharged operation. This was accomplished with the standard Clark conversion kits, thereby increasing the rating of each unit from 1760 to 2050 bhp while at the same time substantially reducing fuel consumption.

To further increase the horsepower of the station, four Clark turbocharged 3400 bhp Model TLA-10 compressors were installed, thus bringing total installed horsepower at Union Church up to 32,050.

The new TLA-10's gave Texas Eastern the positive dollar saving advantage of large blocks of horsepower which users have found results in lower installed and operating costs per bhp. Another important benefit of installing TLA-10's was the ability of these compressors to operate at compression ratios of 1.275 to 2.0. This is a vitally important factor in obtaining maximum operational flexibilty and expandability for future development.

Pipeline operators have found that the special low ratio pipeline compressor cylinders and Clark low loss nylon poppet valves used on the TLA-10 assure highest compression efficiency at a wide range of ratios. The constant pressure, pure turbocharging system used on the TLA, HBA-T and the new TBA permits operation of these units over a wide range of constant torque speeds at utmost fuel economy over the entire range. The Clark System of turbocharging also assures ample reserve *power* for emergency overloads, and traditional Clark ruggedness means the *stamina* is there to handle it.

There are four models of Clark TLA compressors available in the 1700-3400 bhp range and four models of TBA compressors available in the 1500-3000 bhp range. Your local Clark representative will gladly give you all the facts.

CLARK BROS. CO., OLEAN, N.Y.

CLARK

DRESSER INDUSTRIES INC.

OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

ENGINES
GAS TURBINES
COMPRESSORS

NOTE:
A total of 56 Clark reciprocating units are operating on the Texas Eastern system, together with 33 centrifugal pipeline compressors, including those serving in the compressor stations immediately above and below Union Church, Mississippi.

Silent Watchman . . .

Providing around the clock dependability for this clean, modern refinery is the presence of utility electric power. In all phases of operation it holds costs down and also brings greater convenience and the advantages of automatic control. Utility electric power not only provides high continuity of service vital in refinery operation, but it also is so adaptable for individual or special requirements and yet flexible enough for many unforeseen requirements. Call your nearest Utility Electric Power Company today for complete details.

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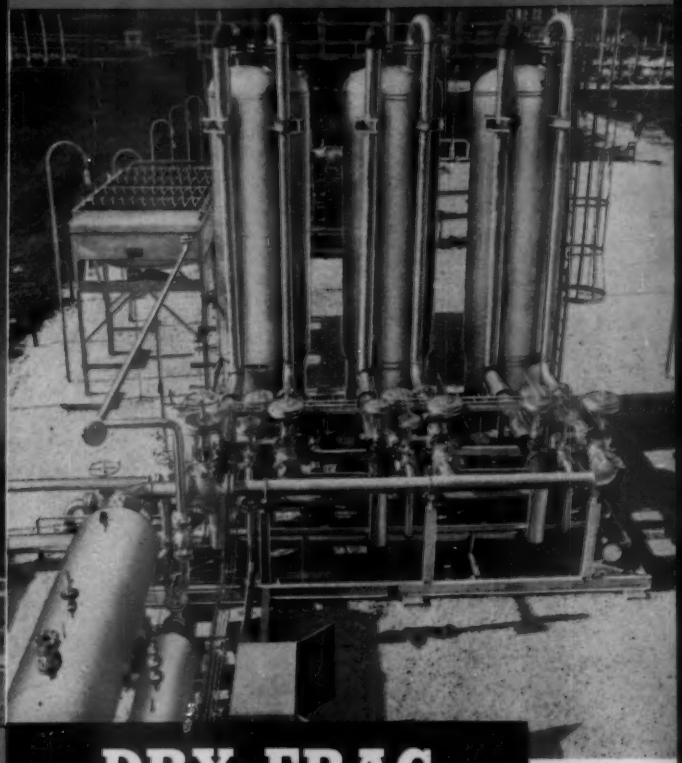
A list of P.E.P.A. members will be furnished on request.

Rich Stream - Lean Stream



COLD FRAC **DRY FRAC**

Different processes - one objective: PAYOUT!

Although the BS&B COLD FRAC and DRY FRAC processes and equipment are entirely different, both will dehydrate gas and recover hydrocarbon liquids while operating on an unattended basis. How, then, can you determine which process will give the best results for a specific application?

Generally, the COLD FRAC process is favored for use on a stream rich in C_5+ hydrocarbons. Variable design factors such as separation temperature, partial stripping of fluid, and balancing of the process to utilize equipment to its maximum capacity greatly affect the economics of this process, but it is not affected to any great degree by inlet temperature.

The DRY FRAC process is highly effective on streams with a low C_5+ GPM. Its efficiency is less affected than that of COLD FRAC by the composition of the wellstream, but it will recover a higher percentage of available pentanes from wellstreams of lean composition.

In addition to economic factors, there are other factors including flow rate, utilities, GPM, pressure and inlet temperature which should be taken into account before a selection of the process is made.

The important point to remember is that your BS&B Man offers a complete line of gas processing equipment, and is therefore in the best position to assist you in getting exactly the right equipment on your lease.

Ask your local representative for full information or write to Black, Sivalls & Bryson, Inc., Dept. 1-A11B P. O. Box 1714, Oklahoma City, Oklahoma.

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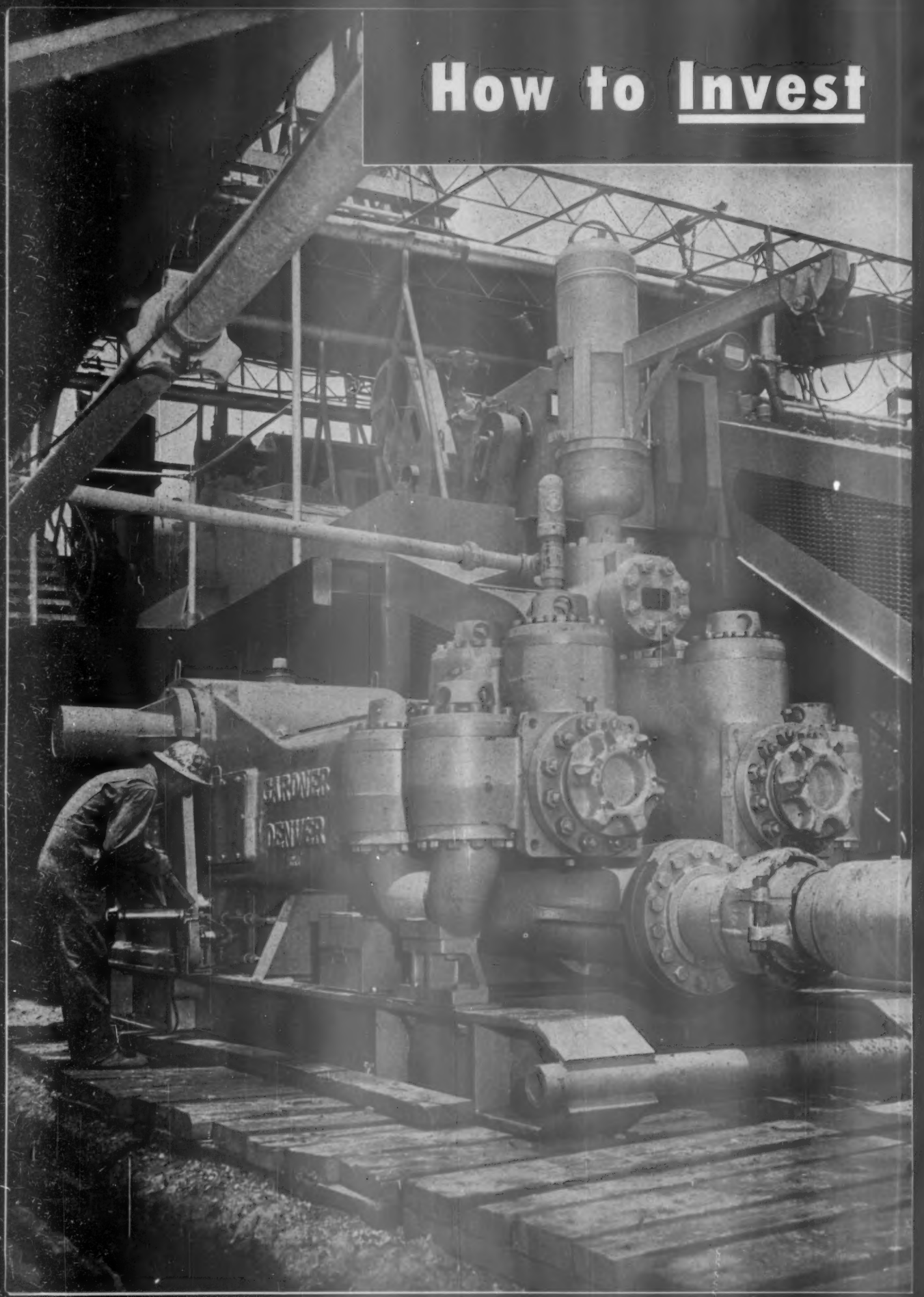
How to Invest



in Drilling Equipment

Drilling equipment well designed for your purpose, made to last, and serviced by a responsible supply company should rule out all other considerations. That's the difference between *buying* and *investing.*

You *know* from experience or observation that good design and long life are inherent in drilling equipment sold by J&L Supply. You *know* that J&L Supply has the organization, the parts inventories, and the determination to service what it sells.

Equipment universally respected by the drilling industry includes *Gardner-Denver Mud Pumps, Republic Hose, Ideco Rigs and Masts, J&L Wire Rope, and J&L Drill Pipe.*

J&L Supply sells the quality equipment you need and offers service facilities and policies designed to save you time and money at every step.

Remember, only quality equipment can give you the performance life that leads to real economy. Invest in quality and save at J&L.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

If it's sold by J&L....
It's the best available

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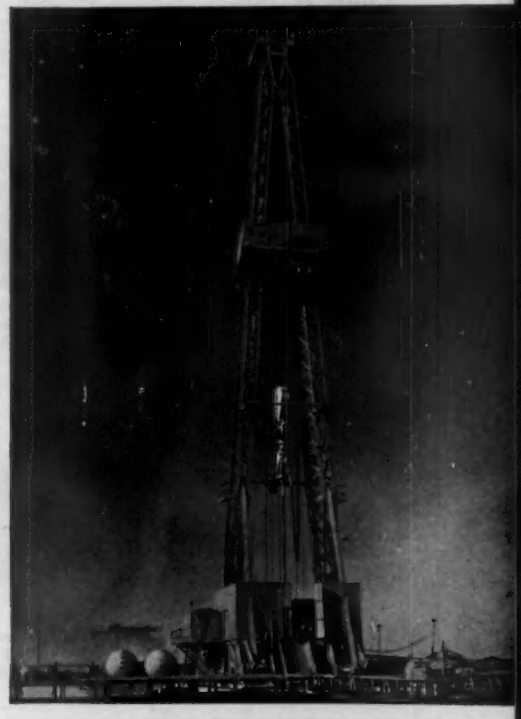
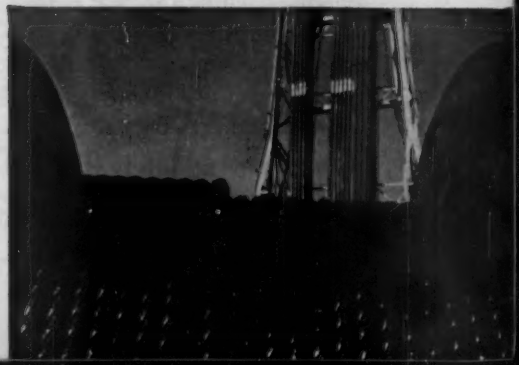
Above — J&L Drill Pipe is made in sizes and grades for drilling to any depth. Ask your J&L Supply man for technical details.



Above — Ideco Full-View Mast. Ask for literature on Ideco Drawworks, Rotaries, Blocks, Masts and Rambler Rigs.

Below — There is real assurance in the rugged strength of J&L Wire Rope.



Gardner-Denver Mud Pump at work in Mississippi. Ask your J&L Supply man for illustrated literature. Parts stocked at near-by J&L Supply stores protect your Gardner-Denver investment wherever you drill.

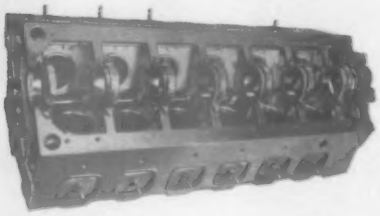
ROILINE GAS ENGINES

are advanced, dependable, and proven in Oil Field Service.

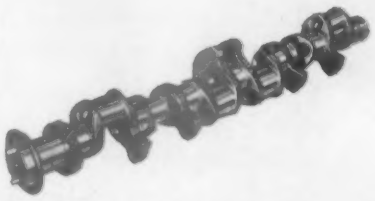
In-line 6, V-8, or V-12 cyls.—up to 706 hp.

HEAVY DUTY... LONG LIFE

A look inside these engines reveals the rugged construction that can be relied upon for dependable service.



Internally ribbed crankcase gives solid crankshaft support. Extra rear main bearing absorbs side thrust.



Large diameter, short in length, the rugged counterbalanced crankshaft handles power without vibration. It has generous bearing areas.

MORE POWER... BETTER ECONOMY

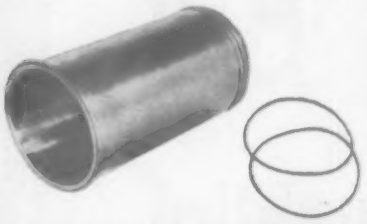
These ROILINE engines are modern, powerful, economical—designed throughout for gas operation.

The "Easy Flow" manifold design provides perfect fuel and air distribution to all cylinders through large individual intake ports.

Aluminum pistons are taper cam ground. Full floating piston pins. Connecting rods have big wear-resisting replaceable bearings.

EASY MAINTENANCE... QUICKLY SERVICED

All wearing parts have replaceable bearing surfaces. *All* routine maintenance points are readily accessible.



Long wearing cylinder sleeves are easily replaced and cost far less than reboring cylinder block and installing oversize parts.

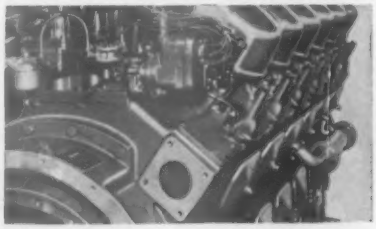
Cylinder heads can be removed by one man without disturbing manifold, carburetor, or controls. Note guided valve mechanism.

SMOOTH—QUIET... CLEAN—COOL

Benefits from newest design features mean more comfortable operating conditions and easier maintenance.

505 *Write for literature*

Hydraulic "Zero-Lash" lifters eliminate noise and adjustments and extend valve life. Engines are practically vibration-free.



Exhaust manifold is water cooled and integrally cast into the crankcase to provide cooler operating area and fast warm-up of the engine.

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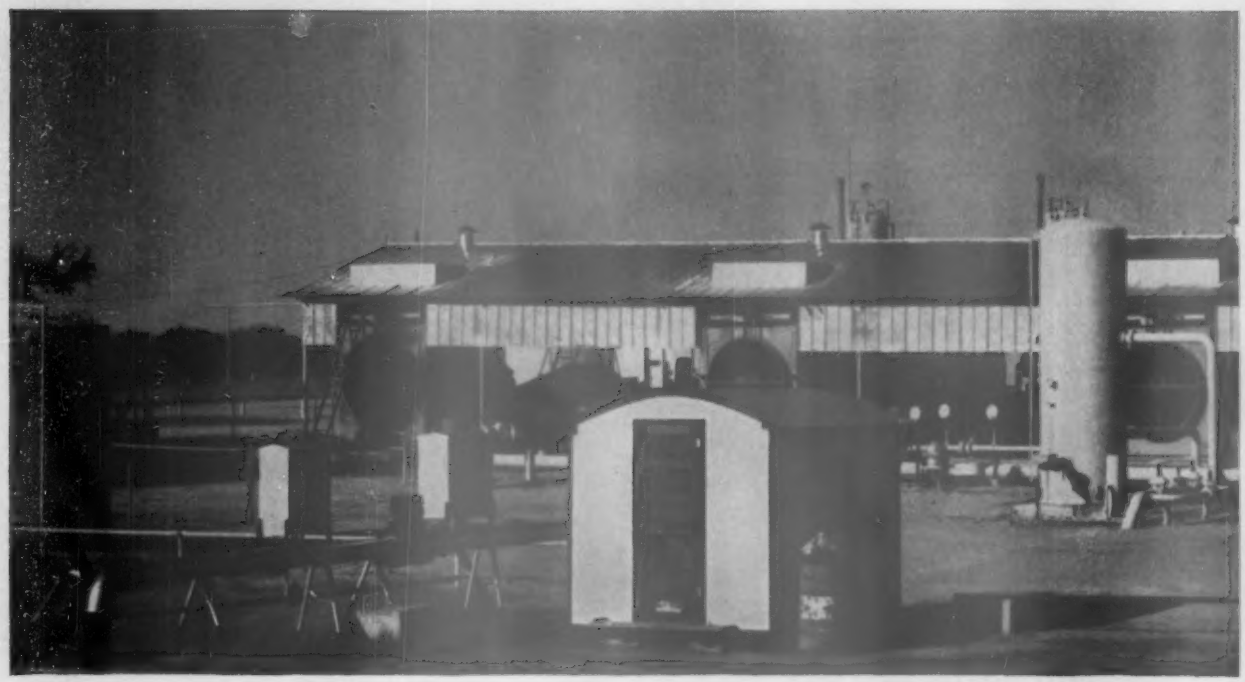
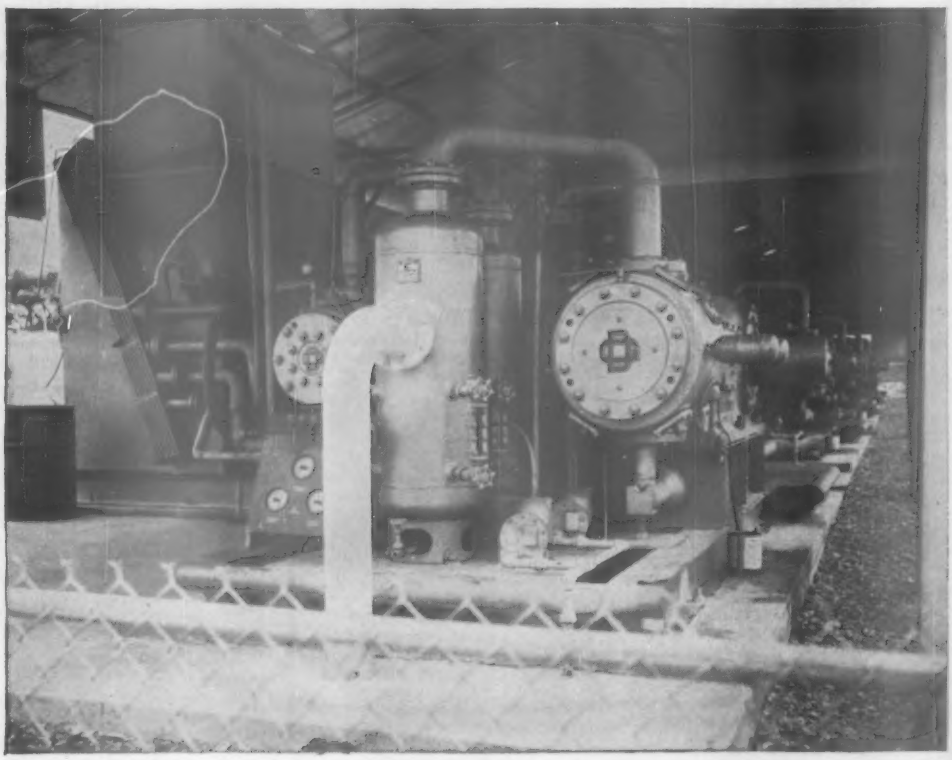
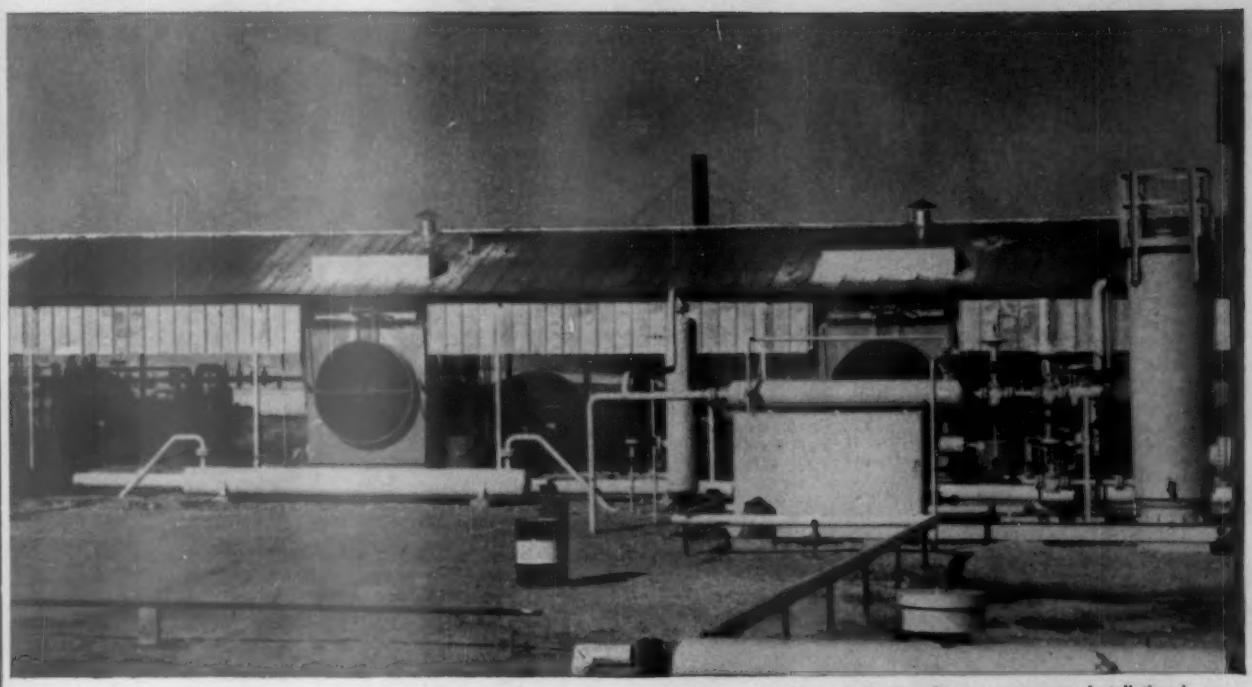


FIVE GARDNER-DENVER COMPRESSOR



One of five Gardner-Denver RXE, size 12 & 5½ x 13 gas compressors at a Southwestern booster station.



Five-unit Gardner-Denver compressor installation handles a total of 9.0 million cubic feet of gas per day.

UNITS BOOST GAS AT 9,000,000 cf/d

Operating Conditions: The series of five units at a Southwestern booster station is handling a total of 9.0 million cubic feet of gas per day from an inlet pressure of 40 psig, discharging at 1000 psig.

Equipment Package: Each of these five units consists of a Gardner-Denver 12 & 5½ x 13, Model RXE, two-stage gas compressor mounted on oil field base with scrubbers, meter, engine, cooling system and automatic controls.

One Source, One Responsibility—Gardner-Denver gas compressor packages are designed and assembled at the Dallas oil field plant. All units are Gardner-Denver package-engineered for matched quality performance.

Gardner-Denver ships directly to your field location . . . helps to install and place packages in operation. And Gardner-Denver always provides field service to keep your compressors in top running condition.

Ask your Gardner-Denver Production Specialist for details.

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They Say-

Busy Hilltop

Dear Sir:

Your writeup of our Hilltop discovery well in the October 31 issue ("Independents Can Play the Deep Country, Too," p. 195) was well done.

My associates and I wholeheartedly agree with your analysis of the importance of the test. I am satisfied that the area will see a good deal of exploration in the forthcoming months.

W. B. Cleary, President
Cleary Petroleum, Inc.
Oklahoma City

Journal goes to college

Dear Sir:

I'm still encouraging our students to invest $3 in the Journal. Several have already followed my suggestion and herein are two more subscriptions.

Do you have any more corelation charts available? I have three students in my subsurface class who could use them for following through on your Exploration Section news—required reading.

I've noted that you include more ages with the formation names than formerly. Many thanks for this improvement. It not only helps me, but also teaches a great number of your readers some geology.

The tear-out sheets are quite a help. We remove the entire Exploration Section, cull out the full page ads, and turn all pages so that the reading appears to the right side of the set of pages. The pages so removed are punched and placed in a three-hole binder. Thus, the student may easily accumulate Exploration Sections for a semester which will not get thicker than one inch. The material is another of his texts.

Many thanks for a fine, informative magazine.

William R. Higgs
Assistant Professor of Geology
Louisiana Polytechnic Institute
Ruston, La.

Unorthodox, but valuable

Dear Sir:

It is indeed a sad state of affairs when the most astute article published on domestic exploration methods in recent years had to be written by a foreigner (OGJ, Nov. 7, p. 208, "The Industry May Soon Need a New Ap-

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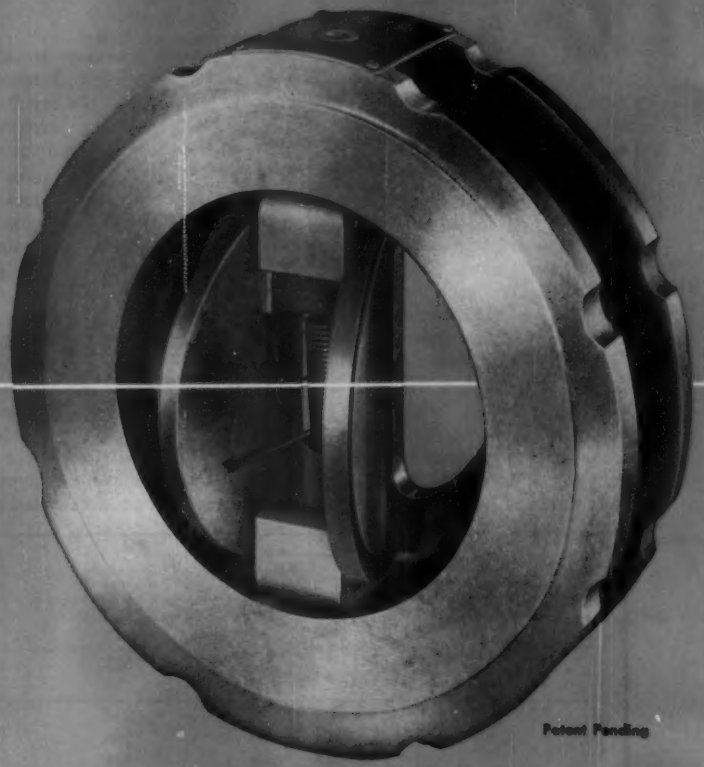

Patent Pending

Mission Duo-Chek valves

Mission Duo-Chek Valves weigh approximately 10 per cent as much as conventional check valves. Smaller, lighter Duo-Chek Valves mean that you save on space, weight, installation, and price. But, you are getting a check valve with a bubble-tight seal, anti-slam closure, long life built in. No load is carried on the plate hinges. No external parts. No lubrication required.

The sine wave seal prevents seepage, yet holds without leaking or distortion at maximum test pressure. The sealing material is molded and bonded into a metal groove, making an "O"-ring type seal. Pressure deforms the packing. Metal-to-metal contact completely encloses the sealing material, preventing pinching off under pressure. Available in steel, 316 stainless, aluminum, and bronze to fit ASA raised face or ring joint flanges.

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ANOTHER MAJOR BREAKTHROUGH FROM DOWELL

FLAC

A new kind of Fluid Loss Additive for Cement that far surpasses anything previously offered

WHAT IT IS. FLAC* is an important new fluid loss control additive for Class A and E neat and Class A bentonite oil well cement systems. Technically, it is a high-molecular-weight, synthetic polymer. It is supplied in the form of a dry powder that is easily mixed into either cement or water.

ADVANTAGES include reliable squeezing or primary cementing—especially in porous, high temperature zones. FLAC is especially useful for permanent type and tubingless completions. Since excess cement can be reversed out before testing, this saves a round trip as well as expensive drilling-out. WOC time is held to a minimum.

WHAT IT DOES. When used in correct concentrations, FLAC drastically reduces fluid loss of the cement slurry over a wide temperature range and at high differential pressures. It is stable at both high and low temperatures and does not affect slurry and set cement adversely. Premature dehydration is prevented and the result is reliable thickening time in squeeze cementing and maximum fill-up in casing cementing.

To give some idea of just how efficiently FLAC reduces fluid loss, here are some representative figures taken from laboratory tests made under simulated well conditions.

These tests were conducted according to API procedures set forth in RP-10B, January, 1960. Slurry was first subjected to appropriate API test schedule in the pressure thickening-time tester. The time interval was equal to that required for slurry placement in a well. Then fluid loss tests were made on the slurry samples in a high-temperature, high-pressure tester. API cement filter screens were used at maximum cementing temperature and at 1,000 psi differential pressure.

Class of Cement	Percent Bentonite	Percent FLAC	Temperature (Degrees F)	API Thickening Time—Hours and Minutes	Fluid Loss at 1000 PSI cc/30 Minutes
A	0	0	113	2:30	800
A	0	1½	113	2:28	35
A	12	0	125	2:30	336
A	12	1½	125	2:40	34
E	0	0	213	1:40	1000
E	0	1	213	2:15	100
E	0	1½	213	2:50	50

FOR MORE INFORMATION on FLAC, contact the nearest Dowell representative. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, France, Germany and the Sahara area. Dowell, Tulsa 1, Oklahoma.

* Dowell Trademark

Services for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

proach to Geophysical Method of Finding Oil," by Amalendu Roy).

Most significant is Amalendu Roy's recognition that the only geochemistry of worth is that which measures hydrocarbons higher than methane (ethane plus). Geochemistry is a generic term and, unfortunately, the acceptance of true hydrocarbon geochemistry has been severely impeded by the countless failures of waxes, trace elements, salt and "undisclosed constituents" which pass for geochemistry.

Three serious reasons for geochemistry's relative non-acceptance are:

A. Consideration of geochemistry as a research project. It was basically and adequately researched by Blau, Rosaire, and Horvitz 20 to 30 years ago and is today a sound and fully developed exploration tool.

B. Failure to recognize that it is more than a "broad reconnaisance tool." Its effectiveness should be judged only on the basis of close grid sampling.

C. The very real danger of "not conforming" on the part of salaried oil finders and the equally justified fear of not being able to promote geochemical prospects on the part of independent oil finders.

Unless we learn to use effective, though unorthodox, methods to find domestic oil that can be produced cheaply, we might just as well all move to Washington and spend the rest of our lives begging the politicians for high tariffs and import restrictions.

Martin J. Davidson, President
Davidson Geochemical Oil Co.
Houston

Independent opinion

Dear Sir:

I would like to take this opportunity to comment on the excellence of your publication and the continuous value that it offers the small independent producer.

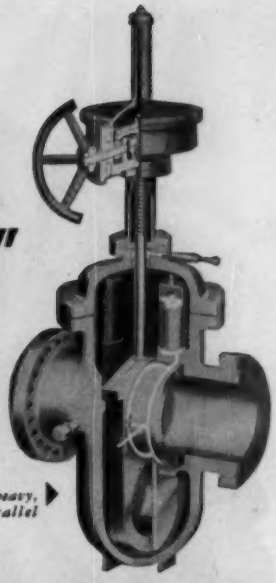
George M. Gernhardt
Independent Oil Operator
Mansfield, Ohio

"New" philosophy really isn't

"For many years crude-oil prices have been so rigid and so little sensitive to supply and demand that oil producers have had little incentive to try to keep the supply of crude oil in balance with the demand for refined products.

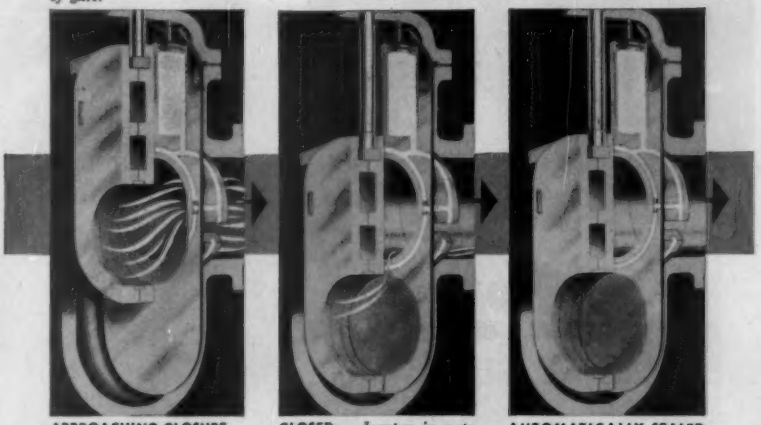
"Apparently, the Texas Railroad Commission is now putting into effect a philosophy of proration which is the same as we have advocated for

NEW ADVANTAGES "GO ON THE LINE" with DARLING-McEVOY Conduit Valves



RIGHT: *Cutaway showing heavy, self-aligning gate and parallel seat assembly.*

BELOW: *diagrams of closure action on downstream side of gate.*



APPROACHING CLOSURE... *No loss of sealant.*

CLOSED... *Jumper in gate permits differential pressure to feed sealant into seat groove.*

AUTOMATICALLY SEALED ... *Pressures again in balance. Tightness established.*

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2. NON-DIRECTIONAL FLOW
3. TWIN SEALANT RESERVOIRS
4. NEGLIGIBLE SERVICING
5. SMOOTH, FULL FLOW
6. REPACKING UNDER PRESSURE
7. EXCEPTIONAL PERFORMANCE AND LIFE

Darling-McEvoy conduit valves, made in 8" and larger sizes, are fully field proved. Now operating continuously on various major lines. For complete information on the self-sealing feature and many other advantages of this unique valve, ask for Bulletin 5402.

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are known throughout the oil patch for their exceptional resistance to any troublesome pumping condition. DuMore is an exceedingly hard alloy composition of chromium, cobalt, and tungsten. The metallurgical properties of this combination are comparable to tungsten carbide — the hardest metal in commercial use today. A bargain at any price, DuMore costs only a little more than regular grade assemblies, but the expense of one pulling job alone will more than pay for fitting out a pump with DuMore Balls and Seats.

Try DuMore the next time you run a pump in a troublesome, hard-to-pump well. You will be more than satisfied with the service you'll get, and you'll like saving those pulling jobs, too! If you want the "Best Ball and Seat in the Oil Patch," ask your supply store about DuMore.

"BEST PUMPS IN THE OIL PATCH"

HARBISON-FISCHER
FORT WORTH

some years, i.e., that proration should be determined by the demand for refined products and not by the nominations of some of the major crude-oil buyers whose refinery runs have been too high.

"The only way to control refinery runs is to control the amount of crude oil available to refiners. If oil production is prorated to balance with the demand for refined products, there are bound to be strong markets for products and the refiners will be in a position to pay a more equitable price for crude oil. The supply of crude oil actually determines the prices of refined products which in turn should determine crude-oil prices. That would be the mechanism of crude-oil pricing, except for artificialities.

"Going back before the days of the East Texas field and the establishment of the first proration laws, I recall that it was generally recognized that the surplus or shortage of crude oil determined the prices for refined products, and that changes in the price of gasoline almost invariably preceded changes in crude-oil prices. Prices were so sensitive to products markets that as many as a dozen or more crude-oil price changes occurred within a single year.

"We would have a much more healthy industry if crude-oil producers were quickly rewarded with higher prices when crude-oil supply is kept sufficiently on the side of scarcity to avoid all excess inventories of crude oil and refined products. The means to accomplish that are available through import controls and state proration."

Paul G. Blazer, chairman, executive and finance committees, Ashland Oil & Refining Co., in a statement to directors of the Kentucky Oil and Gas Association, Illinois Oil and Gas Association, and Ohio Oil and Gas Association.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

NOVEMBER

21-22 American Institute of Mining, Metallurgical, and Petroleum Engineers, Gulf Coast section, formation evaluation conference, Cullen Auditorium, Houston.

27-Dec. 2 American Society of Mechanical Engineers, winter annual meeting, Statler Hilton Hotel, New York City.

29-30 Western Petroleum Refiners Association, computer conference, Tulsa Hotel, Tulsa.

DECEMBER

1-3 American Chemical Society, south-

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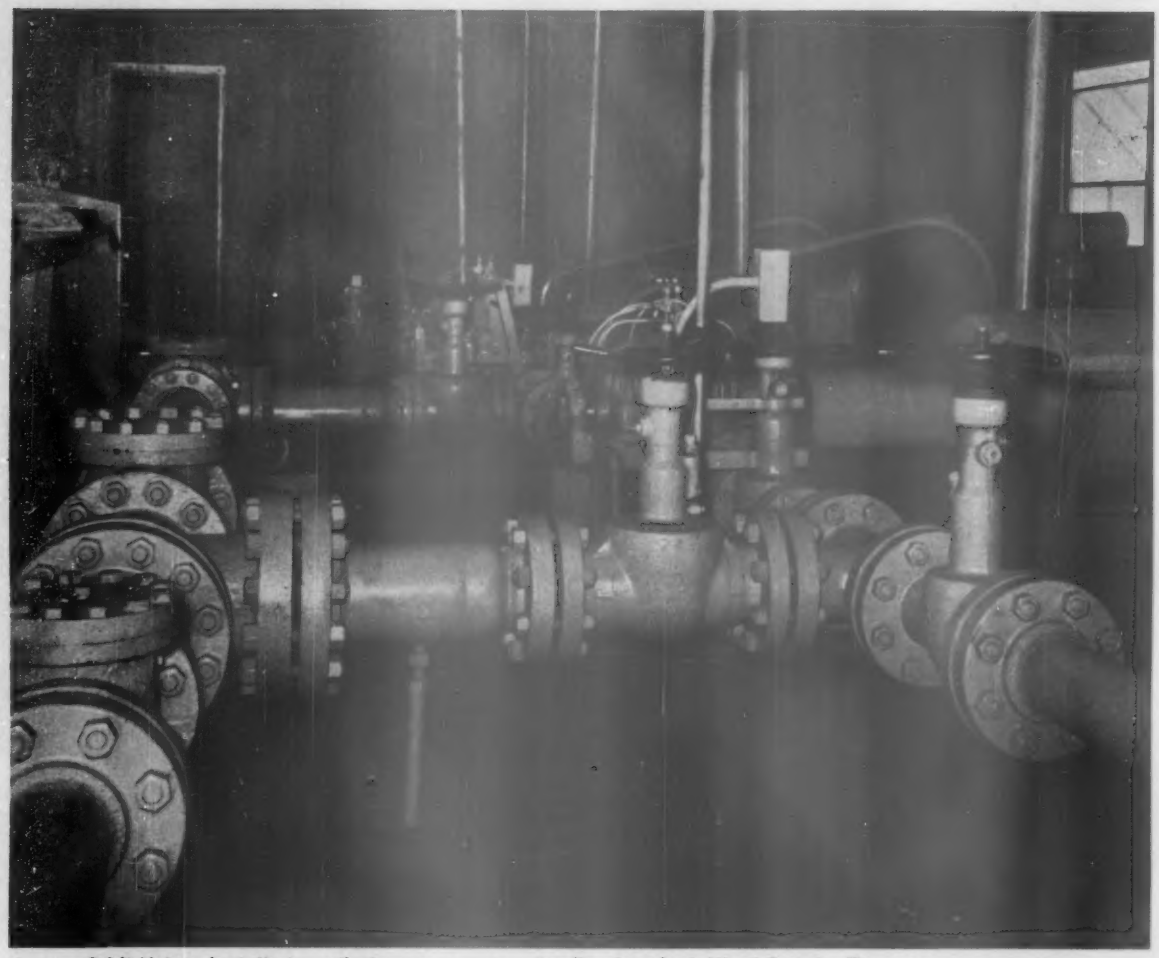

Orbit Valves installed on discharge pumps, water flood project, Ward County, Texas.

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west regional meeting, Biltmore Hotel, Oklahoma City.

2-3 South Texas Geological Society, field trip, Cretaceous stratigraphy between San Antonio and Del Rio, Tex.

4-7 American Institute of Chemical Engineers, meeting, Statler Hotel, Washington.

5-7 Interstate Oil Compact Commission, annual meeting, Westward Ho Hotel, Phoenix.

9 Tulane University, School of Law, and American Association of Oilwell Drilling Contractors, fifth annual program on mineral and tidelands law, University Center, Tulane University, New Orleans.

26-31 American Association for the Advancement of Science, annual meeting, New York City.

JANUARY

15-18 Pipe Line Contractors Association, annual meeting, Mark Hopkins and Fairmont Hotels, San Francisco.

16-19 Instrument Society of America, winter instrument-automation conference and exhibit, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis.

17-19 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

18 Institution of Mechanical Engineers (Great Britain), symposium on pressure vessel research toward better design.

20 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

22-24 Kansas Oil Men's Association, annual convention, Broadview Hotel, Wichita.

24-27 Society of Plastics Engineers, seventeenth annual technical conference, Shoreham Hotel, Washington, D. C.

30-Feb. 9 University of Illinois, annual quality control short course, Urbana, Ill.

FEBRUARY

7-8 University of Oklahoma, School of Petroleum Engineering, advanced petroleum engineer seminar, University of Oklahoma, Norman.

8-10 Southwestern Legal Foundation, twelfth annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

14-15 National Association of Corrosion Engineers, Shreveport, La., section, short course, Centenary College, Shreveport.

15-16 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, Robert Driscoll Hotel, Corpus Christi.

18 Purdue University, business history conference, "Management Decisions Under Government Regulation," Memorial Union, Purdue University, Lafayette, Ind.

24 Natural Gasoline Association of America, South Louisiana regional meeting, Lafayette Petroleum Club, Lafayette, La.

26-Mar. 1 American Institute of Chemical Engineers, petrochemical and refining exposition, Municipal Auditorium, New Orleans.

26-Mar. 2 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Chase and Park Plaza Hotels, St. Louis.

MARCH

1 Institution of Mechanical Engineers (Great Britain), symposium on user

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experience of large-scale industrial vacuum plant, London.

3 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus.

7-8 University of Oklahoma, School of Geological Engineering, seventh biennial geological symposium, Student Union Building, University of Oklahoma.

8-10 American Petroleum Institute, Division of Production, southern district meeting, Captain Shreve and Washington-Youree hotels, Shreveport, La.

13-16 Kentucky Petroleum Marketers Association, sixth management institute, conducted by the University of Louisville, Brown Hotel, Louisville.

13-17 National Association of Corrosion Engineers, annual meeting and corrosion show, Hotel Statler, Buffalo, N. Y.

15-17 Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas.

21-23 American Power Conference, twenty-third meeting, Sherman Hotel, Chicago.

22-24 American Petroleum Institute, Division of Production, southwestern district meeting, Cole Hotel, Albuquerque.

23 National Industrial Conference Board, general session, Shamrock-Hilton Hotel, Houston.

27-29 Midwest Gas Association, annual meeting and convention, Sheraton-Fontenelle Hotel, Omaha.

27-31 Instrument Society of America, symposium on temperature measurement and control in science and industry, Veterans Memorial Auditorium, Columbus, Ohio.

28-29 University of Oklahoma, Schools of Petroleum and Gas Engineering, gas conditioning short course, Oklahoma Memorial Union Building, University of Oklahoma, Norman.

APRIL

4-5 University of Kansas, gas compressor institute, Liberal, Kans.

5-7 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Mayo Hotel, Tulsa.

6-7 University of Oklahoma, School of Mechanical Engineering, short course on industrial engines, University of Oklahoma, Norman.

9-12 Western Petroleum Refiners Association, annual meeting, San Antonio, Tex.

9-13 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Jung Hotel, New Orleans.

10-11 American Society of Mechanical Engineers, maintenance and plant engineering conference, Bancroft Hotel, Worcester, Mass.

11-13 Petroleum Industry Electrical Association and Petroleum Electrical Supply Association, annual conference, Moody Convention Center, Galveston, Tex.

17-19 Instrument Society of America, symposium on instrumental methods of analysis, Shamrock-Hilton Hotel, Houston.

18-20 University of Oklahoma, southwestern gas measurement short course, North Campus, University of Oklahoma, Norman.

19-21 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

20-21 Society of Petroleum Engineers of AIME, East Texas-Louisiana-Arkansas gas-technology symposium, Tyler, Tex.

24-26 Southern Gas Association, meeting, New Orleans.

24-27 American Association of Petroleum Geologists, Society of Economic Paleontologists, and Rocky Mountain section of AAPG, annual meeting, Denver Hilton Hotel, Denver.

26-28 American Petroleum Institute, Division of Transportation, pipeline conference, Chase-Park Plaza Hotel, St. Louis.

28 Natural Gasoline Association of America, Oklahoma regional meeting, Lake Murray Lodge, Ardmore, Okla.

30-May 2 Independent Petroleum Association of America, midyear meeting, Roosevelt Hotel, New Orleans.

30-May 3 Liquefied Petroleum Gas Association, convention and trade show, Conrad Hilton Hotel, Chicago.

MAY

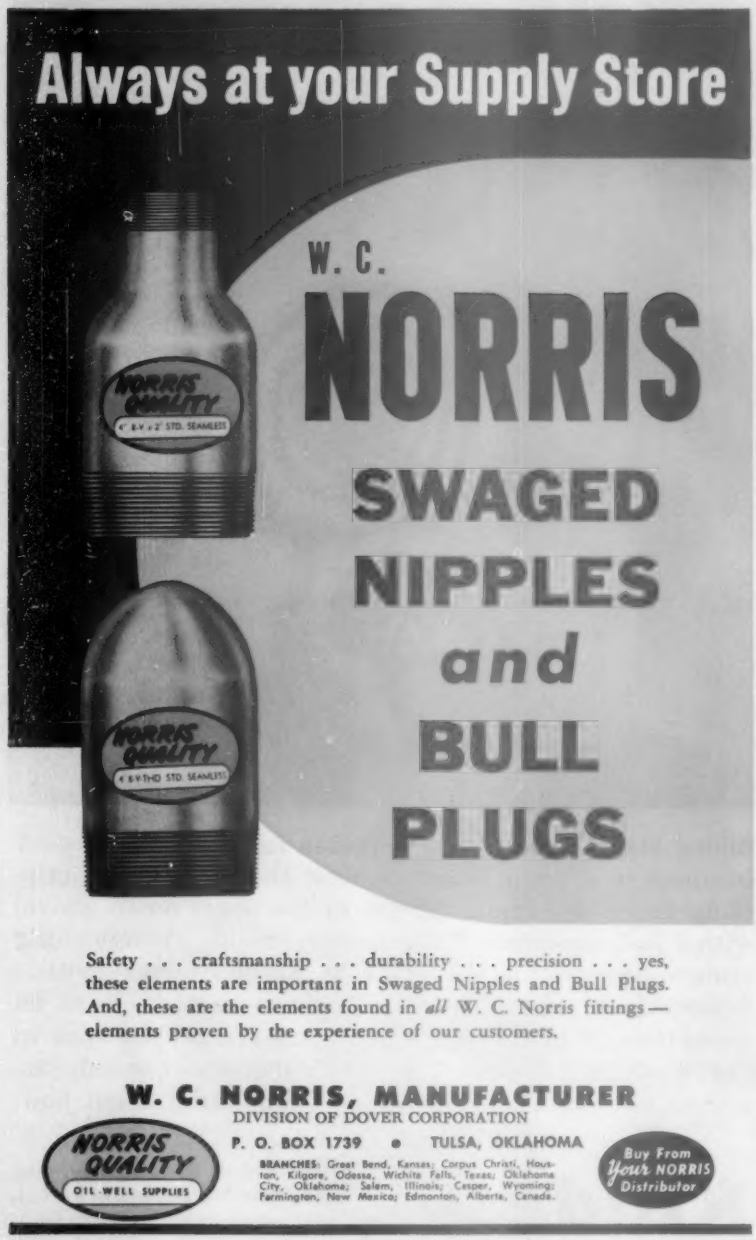
3-5 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone-Henning Hotel, Casper, Wyo.

4-5 Society of Petroleum Engineers of AIME, oil recovery conference, Midland, Tex.

4-5 Pacific Coast Gas Association, Inc., transmission conference, Biltmore Hotel, Santa Barbara, Calif.

7-10 American Institute of Chemical Engineers, meeting, Sheraton-Cleveland Hotel, Cleveland.

8-11 American Petroleum Institute, Division of Refining, midyear meeting, Rice Hotel, Houston.



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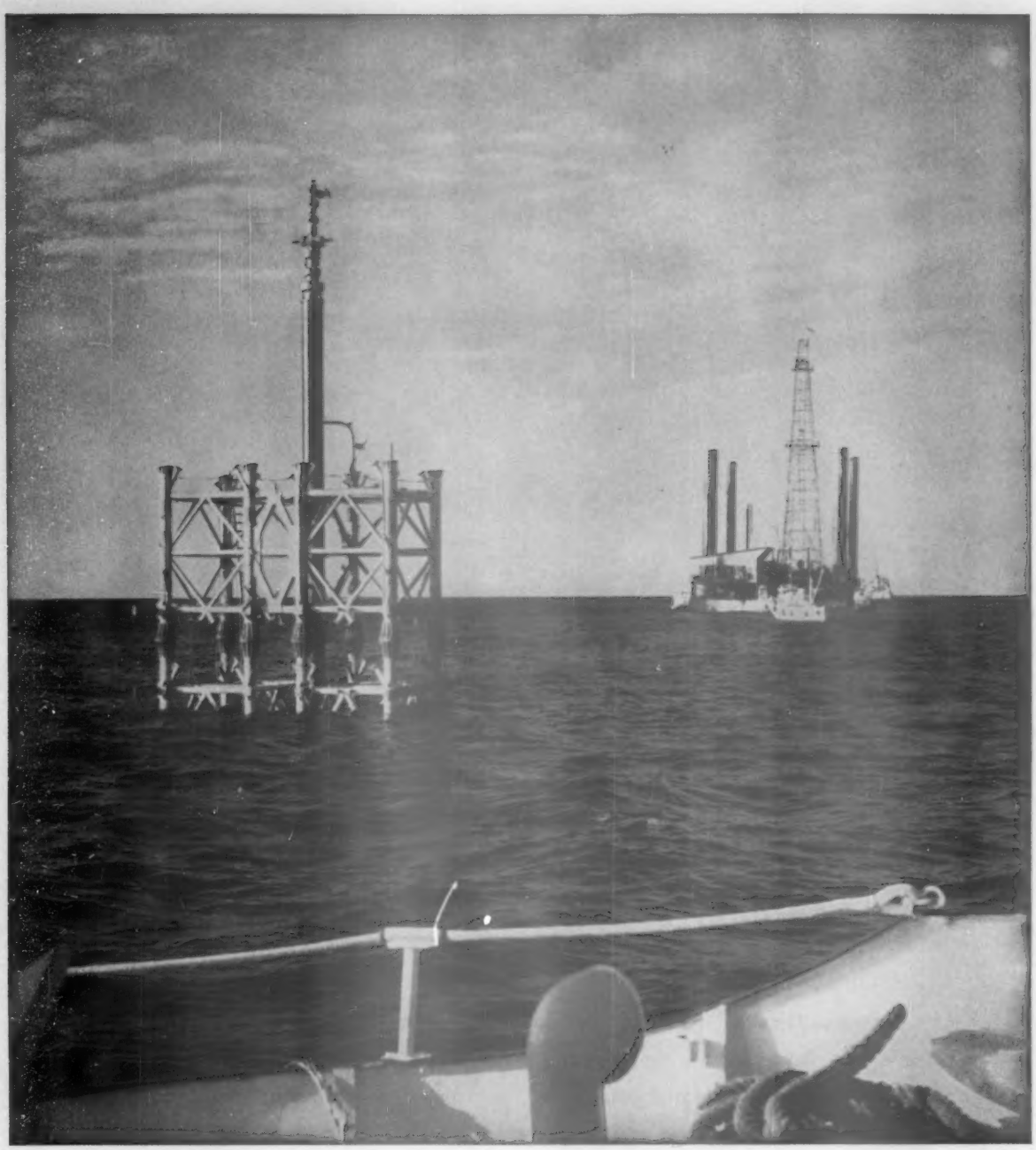


ABU DHABI

A well head in the Persian Gulf. In the background, the barge "Adma Enterprise" which is currently drilling beneath the waters of the Gulf. The results are sufficiently encouraging to warrant the preparation of facilities for regular production. This stage should be reached by mid-1962.

BP

50 years ago

December 1, 1910

Markham, in Matagorda County, easily is leading all Gulf Coast fields with daily oil production now above 10,000 bbl. Not since the early boom days has there been so much activity in the field. The new Vinton field, in Calcasieu Parish, Louisiana, leads in drilling with 22 rigs running.

Busch-Everett Co., which recently announced plans for laying a pipeline from the big Caddo field of northwestern Louisiana to supply St. Louis with natural gas, has abandoned the project. Engineering reports indicated that transportation of natural gas a distance exceeding 200 miles would be impractical.

J. F. Lucy Co., one of the leading oilfield suppliers in California for many years, extends its coverage to the Mid-Continent area, where headquarters for its Lucy Supply Co. have been opened in Tulsa.

25 years ago

November 28, 1935

New deep wildcat test started by Humble Oil & Refining Co. on beach (McFaddin Beach) 10 miles east of High Island, in Jefferson County, Texas Gulf Coast, stirs interest of oil companies as possible forerunner of extension of drilling into the Gulf of Mexico.

Amerada Petroleum Corp. opens Cheneyville (Bunkie) field in southeastern Rapides Parish as first production in Louisiana on long extension of Texas' prolific "Conroe Trend." Discovery well (1 Weil), far removed from nearest field of either North or South Louisiana and more than 20 miles from nearest other test ever drilled, flows 2,300 M.c.f. of gas and 150 bbl. of condensate daily from Cockfield sand at 5,705-10 ft.

10 years ago

November 30, 1950

Shell Oil Co. reveals 800-well drilling program to be carried out during the next several years in California's older fields to develop deeper oil reservoirs and pools passed up in earlier development. Company now has 15 rigs running in state.

Second submarine gas pipeline for Gulf of Mexico planned by United Gas Pipe Line Co. New 20-in. line to transport gas and condensate from Pure Oil Co.'s Eugene Island Block 32 field, 15 miles offshore from St. Mary Parish, Louisiana, to connect with United's onshore Louisiana system.

JOURNALLY SPEAKING

Those Russian Oil Men

"FIVE-HUNDRED revolutions per minute!" exclaimed Gennadi Konstantinovich Maksimovich, chief drilling and production engineer in the Soviet Union. Perhaps the old Bolshevik was startled at the speed of the pump about which he had inquired at Mobil Oil's Paulsboro, N. J., refinery. Perhaps his extremely subtle sense of humor was at work again.

There was no telling. For there was no end to the surprising turns in the makeup of the nine Russians who spent October 13 to November 13 on an exchange tour of the American oil industry. Giving the lie to the stolid Russian stereotype, their sense of humor ranged from the broadly male (when a Paulsboro chemist was introduced as being in charge of an entire laboratory, including the girls in the next room, he was congratulated on having the best job in the refinery) to delicate punning.

This was a very human group, too. They were always eager to please and to be pleased, and were deeply grateful for the universal welcome extended by their oil-men hosts. "You have received us as fellow engineers," Maksimovich told me.

They were a very dedicated band, and very smart. Relentless in their questions, they gave their hosts a brisk drill on their own operations. They spent a month of dawn-to-dark days in plants, fields, and laboratories, soaking up American know-how on a scale that will certainly justify Russia's investment in the trip.

Most of the Russians spoke some English; all read technical English. And they were an alert group. On the infrequent occasions when the interpreter erred in translating an answer to one of their questions, they immediately corrected him.

Asked what aspects of the American industry impressed them, the Russians were usually very vague, affecting a blase attitude toward the modern plants and fields they had seen. But Maksimovich, in a burst of candor, said, "This visit will be of utmost significance to the petroleum industry of the Soviet Union."

The Russians had a keen comprehension of all phases of the U. S. industry save one. When the subject turned to the American business system or anything related to it, they were lost. It was to them a riddle wrapped up in an enigma.

When the chartered bus taking the delegation to Paulsboro stopped at the New Jersey Turnpike toll gate, Maksimovich complained of the inconvenience of such a system. I didn't bother to point out that you could not find such a fine highway, free or otherwise, anywhere in the USSR.

Riding down the superhighway, in sight of an endless parade of automobiles, he kept clucking, "What a waste."

He saw the multitude of companies producing, refining, and marketing oil, and shook his head. "What a waste. I could run it all myself, and much more efficiently."

The bus passed the Esso Research & Engineering center at Elizabeth, and headed toward Paulsboro, where Mobil also conducts research on some of the same problem. "What a waste, this duplication," he said.

We talked of patents and licensing arrangements for refining processes, and he was mystified. The strangeness to the Soviet socialist mind of individual enterprise, and the right to profit from its fruits, caused the only misunderstanding of the trip. The Russians couldn't understand why Standard of California had no right to show an outsider the reforming and dewaxing units which were covered by licensing arrangements.

When they saw Mobil's display representing the Mobilgas economy run, they were really at a loss. This masterly piece of product promotion completely escaped them.

The most vigorous tongue-clucking of Maksimovich was inspired by the forest of derricks in East Texas. What a waste! It was estimated the excessive investment in wells beyond what was required to drain the reservoir—whose pell-mell development is a relic of a bygone era—was $100 million.

In a supply store, Maksimovich saw stocks of pumps and valves. Told they were produced wholly on speculation in hopes of selling them at a profit, he was incredulous. "In Russia," he said, "we design a plant, order the parts a year in advance, and then the manufacturing plant produces only what is needed."

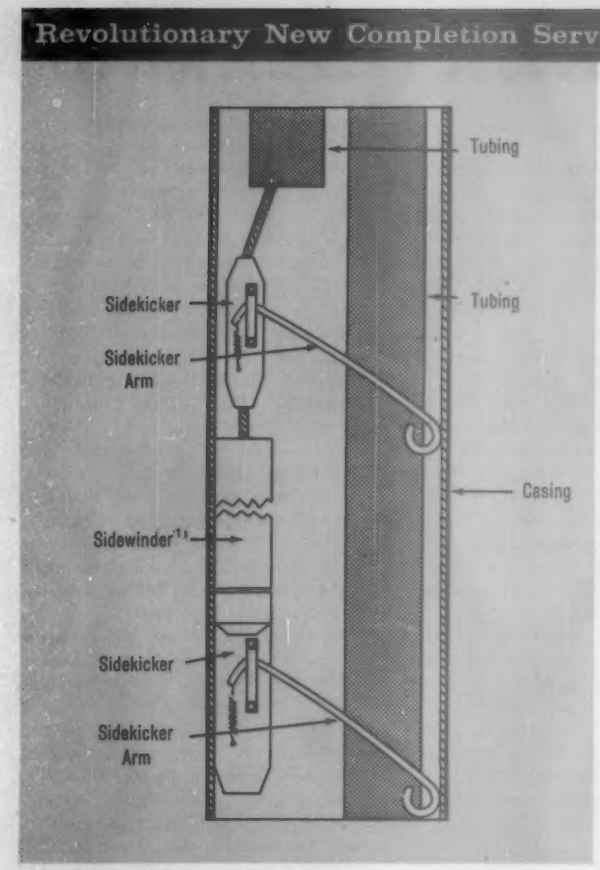
What are his industry's most troublesome technological problems? They have none.

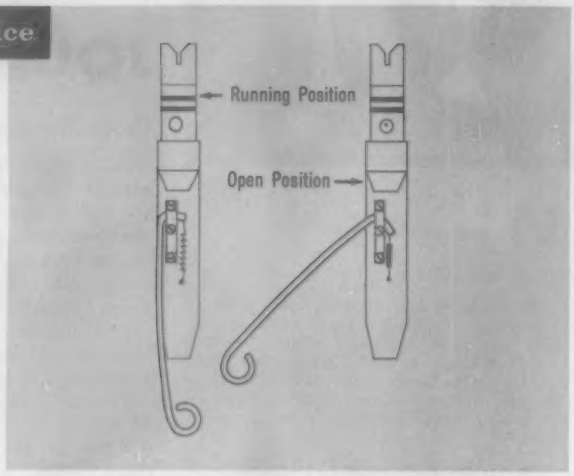
What, then, is the limiting factor in expanding Soviet oil production?

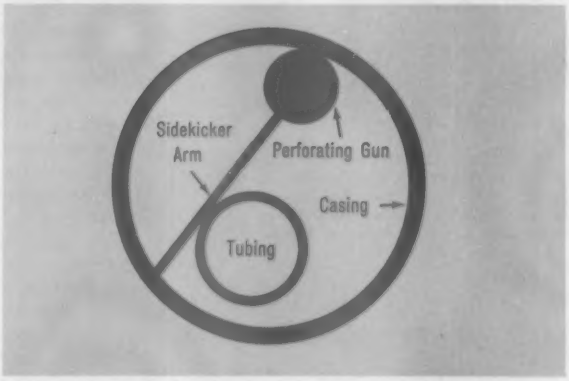
"Equipment," Maksimovich said. "We have a serious shortage of equipment."

—Gene T. Kinney

Revolutionary New Completion Service







Sidekicker Solves Dual PWC* Problems

*** Permanent Well Completions**

Welex engineers have answered the problem of perforating an upper zone with no risk to the adjacent tubing string in dual permanent well completions. The new development — another first by Welex — offers these advantages:

- Service can be performed through 2″ tubing and standard seating nipples.
- The Sidekicker, a mechanical orienting decentralizer developed by Welex, forces the Sidewinder[1] perforating gun against the side of the casing, assuring maximum penetration.
- The Sidekicker positions jet gun so that the charges will fire outward through the casing — never in the direction of the adjacent tubing string.
- Sidewinder[1] retrievable carrier absorbs the shock of detonation, protecting adjacent tubing string from damage.
- Absolutely no debris is left in the hole. All debris is retained in the carrier and returned to the surface.

Welex, the company that originated jet perforating proudly adds this new service to the other "firsts" that it has introduced to the oil industry.

In Permanent Well Completions, as well as in other types of completions, Welex has a complete set of tools for every job. Next time and every time let Welex's completion services work for you.

WELEX, INC.

ORIGINATORS OF Welex JET PERFORATING

General Offices: 1400 East Berry, Fort Worth, Texas
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[1]*Trademark of Jet Research Center, Inc.*

Oil's recovery is a do-it-yourself plan

OPTIMISM DIES HARD in the oil business.

It has taken oil men 4 or 5 years to realize that the industry does not have built-in automatic growth factors that guarantee success to anyone who can find oil and bring it to the surface.

Now the majority accept the fact (though they may not understand all the reasons for it) that customers are not clamoring for a lot more of their product, that demand may creep upward at a snail's pace in the near future, and that they must pin their hope of profits on something other than continual increase in volume output.

NOT PESSIMISM BUT REALISM is the mood today. Oil men are "running scared" instead of coasting.

For a long time they assumed that the industry was simply undergoing a temporary setback. Now they see that it is bordering on obsolescence and that there is a danger that obsolescence could become a permanent condition unless they do something about it. So they are beginning to do things about it.

This changed attitude was notably in evidence at the recent API meeting, where speakers not only exhorted the need for new thinking but outlined specific avenues of action to prune out the obsolescence and adapt the industry to the changed conditions. .

Lines of attack include such things as:

- Modernization of state regulations that require unnecessarily costly producing methods.
- Selective capital investment aimed at increasing productivity rather than producing capacity, at making profits without upping volume.
- Shifting cost-cutting programs from retrenchment to critical scrutiny of old habits and inventing better ways of doing things.
- Streamlined corporate reorganization to eliminate duplication and paperwork and stimulate teamwork and creative thinking.
- Marketing research in depth to get at the roots of dealer and customer dissatisfaction and the lack of profits.
- Management keyed to the tune of the times, capable of creating new opportunities and generating an attitude of progress in other people.

A NEW KIND OF OPTIMISM is replacing the old pollyannish philosophy that things will turn out all right if we just sit and wait. Complacency gave way to frustration, and frustration is now giving way to action.

Since no help seems to be forthcoming from other quarters, the industry is now undertaking to bring about its own economic recovery.

This is the optimism of the do-it-yourselfer, of the pioneer whose destiny is in his own hands. It promises results for those who practice it. Those who cling to the old sit-tight-and-wait brand of optimism may find themselves in a permanent condition of obsolescence.

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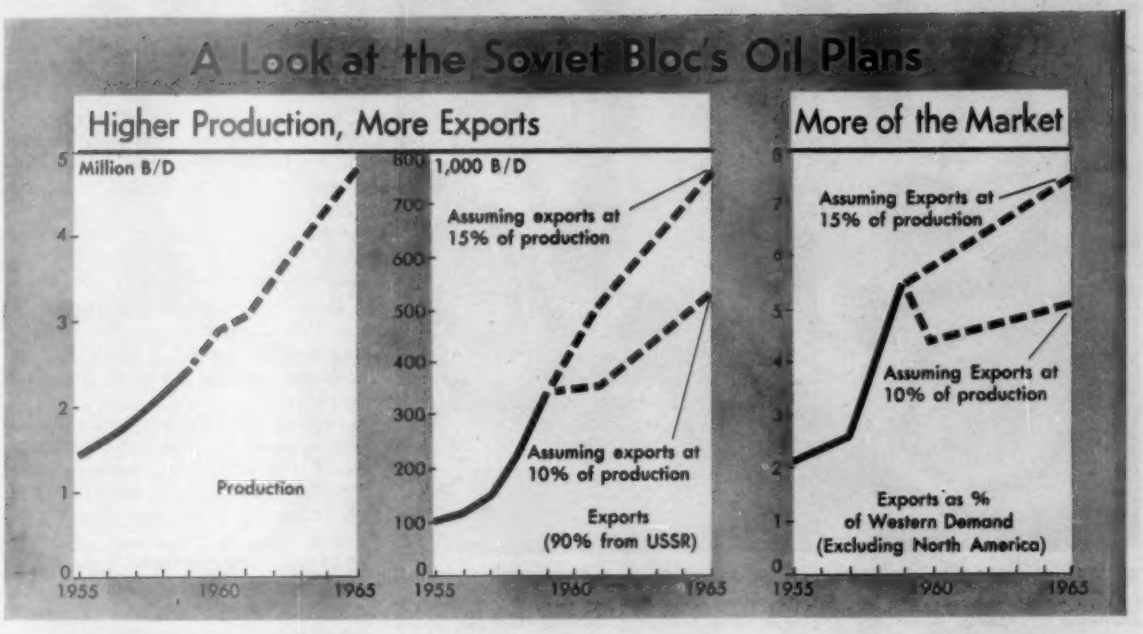
A Look at the Soviet Bloc's Oil Plans
Higher Production, More Exports
Million B/D
Production
1,000 B/D
Assuming exports at 15% of production
Assuming exports at 10% of production
Exports (90% from USSR)
More of the Market
Assuming Exports at 15% of production
Assuming Exports at 10% of production
Exports as % of Western Demand (Excluding North America)
1955
1960
1965

Market for Russian Exports Has Limits

● Political considerations restrict Soviet oil shipments into many markets. Future exports to traditional western markets are not expected to increase faster than rising demand. But price shaving is going to continue.

Paul Swain
International Editor

SOVIET oil, the bugaboo every international marketer has been seeing behind every door, may be losing some of its ability to intimidate the industry.

Russian oil is a reality and not a bugaboo. More and more western oil companies are recognizing the fact that communist oil is no longer knocking at the door of the market place. Soviet oil is inside and is apparently here to stay, cheap or not. The Russians themselves say so.

This recognition brings with it some marketing reflections that things may not be quite so bad as they once looked. There are definite limits to what the Russians may be able to do with their oil, both from the standpoint of existing and potential markets and the Soviets' ability to move the oil they produce.

The oil industry, like the rest of the free world, made the mistake of underestimating the Russians. The awakening was just a little shocking.

To the companies who produce, refine, and market most of the world's oil, the steadily rising curve of Russian oil exports to traditional western markets has been a pretty bitter pill to swallow. But, recognition of a possible Russian threat on a wholesale basis has dulled some of that initial dismay. It has brought about some careful analysis and reveals, at least to some extent, a pattern of the future.

Predicting the unpredictable Russians is tricky at best, but here's how the pattern is beginning to emerge:

... **Russian oil** is going to be just one more troublesome factor in a world oil market already pretty well crowded with danger signs.

... **The market share available** to the Russians is going to be limited in the future, more and more by political considerations.

... **Market goals of the Soviet** are already pretty well set by the Russians themselves and are tied fairly closely to the sharply rising production goals which the communists can meet without a great deal of trouble.

... **Future Russian oil exports** to traditional western markets should not increase at a greater rate than those markets themselves expand.

... **Political motives** could upset any or all of these pieces in the future pattern if the Russians should choose to do so, but Soviet officials themselves insist they have no such intention—now.

... **Price shaving is going to continue** to be a Russian tactic, but it will be done mostly through bilateral and political trade pacts, primarily tied to some sort of barter arrangement.

Russian motivations . . . There are still three schools of thought with regard to the Russians in the international oil industry. While analytical opinion on what the Russians have in mind and plan to do is divided, the consensus is more or less the middle ground between two extremes.

The three versions of what-Russia-

RUSSIAN PLANS to get a bigger share of the world market were bluntly stated by E. P. Gourov, left, at the Second Arab Oil Congress. His companion is Matthew J. Sladic, American engineer who formerly worked for the Saudi Arabian Government.

is-likely-to-do can be pretty well summed up as follows:

... Oil is the best economic tool the Russians have to build the Soviet Union both internally and externally. Since oil is about the only exportable product the Russians have, they plan to make the most of it to build international trade and obtain goods they can use. At the same time, they will make every possible use of oil as an energy source to build Soviet Russia internally.

This school of thought believes that Russia, with vast oil reserves still barely tapped but being developed rapidly, is going to be a tough competitor in the world market place as it tries to trade oil for other industrial and agricultural commodities—items the country needs to make it strong both internally and for the external battle against the free world.

... Soviet oil as a political tool is the most potent weapon the communists have and the strategists in the Kremlin are going to use it to every possible advantage to lure politically neutral nations into the Red camp.

Those who espouse this view believe that markets, economics, costs—and even trade balances—weigh little with the Russians who want to use a plentiful oil supply for this purpose.

... The middle ground between the two views is probably the most prevalent among competent western observers.

Those who look at Russian oil from this standpoint believe that the Soviets will, in those cases in which it is politically expedient, use oil as a double-edged sword to gain themselves political advantage at the expense of pure economic gain.

These will be isolated instances. The primary purpose in Russian oil exports will still be economic. The overriding idea in selling Russian oil will still be to obtain foreign exchange or foreign goods which the Russians need.

Proponents of this view are quick to point out that the Russians are already bumping hard against some basic economic facts of today's international oil market which they cannot ignore even if the condition of the market would allow them to do so.

Historical Russian market spot . . . The Russians themselves are candid in their marketing aims. The best and certainly the most recent capsule of Russian plans in the oil market place was handed to the West at the recent Arab Oil Congress at Beirut. There, in an attempt to defend his country's oil trade policies, E. P. Gourov, head of the Russian Sojuznefteexport, struck back at those who have accused the Russians of "dumping" oil on a distressed market.

Gourov pointed out that Russia's oil exports in the 1922-1940 era ranged from 14% to as high as 30% of Soviet oil output. He said Russia had relinquished its rightful share of this market in the years following World War II because of the need to build the Soviet Union internally.

Now, he said, the Russians are "only renewing our legal place among the exporting countries, which belonged to us in the prewar years and which was forfeited by us owing to conditions of wartime as well as due to the necessity of reestablishing home industry immediately after the war."

Gourov went on to explain that in the 1956-59 period Russian exports to the countries of western Europe amounted to only 4.4% of Soviet oil output.

In the 1955-1959 period the Soviet bloc exports to the non-communist world outside North America rose steadily from 2.3% of western world oil demand to 5.3% last year.

The Russian oil output goal for 1961 is 3,100,000 bbl. daily, compared to an estimated 2,900,000 bbl. daily this year. By 1965, the Russians say they will increase this to 4,800,000 bbl. daily.

Those who have had the opportunity to look over parts of the Russian oil industry, as did 10 representatives of the U. S. industry earlier this year, doubt the ability of the Russians to meet these goals. In fact, they will probably surpass them.

The important fact in all this is the avowed Russian purpose in exporting from 10% to 15% of this production in future years. If the Russians meet these export goals, their total crude and product exports to the non-communist world in 1961 will range somewhere between 355,000 bbl. daily and 510,000 bbl. daily.

If they succeed in maintaining this rate of export into 1965, the total crude and product exports will range between 525,000 bbl. daily and 765,000 bbl. daily.

These figures represent large-sized increases in present Russian exports, but what is more important is the size of these planned exports in relation to expected world demand in the non-communist areas outside North America.

If the Russians export 10% of their planned 1961 production—and market it successfully—they will be able to boast of 4.5% of the market. If they move to the 15% of production figure, they will be able to garner 6.6% of the non-communist world demand outside the U. S. and Canada.

Assuming they can continue this increasing curve of production and

Italy's New Deal With Russia Alarms West

ALREADY the leading western purchaser of Russian crude and products, Italy last month signed an agreement to take 60,000 bbl. daily of Russian crude over a 4-year period in exchange for large-diameter pipe, pipeline equipment, and synthetic rubber.

Both Moscow and Enrico Mattei, head of the government-owned Ente Nazionale Idrocarburi, publicized the new agreement, but both left a number of salient facts connected with the deal just a bit obscure. This has probably been done deliberately.

Just exactly how high the new contract will boost Russian shipments of crude to Italy is a question. The contract calls for 12,000,000 tons of oil over the 1961-64 period. This averages 60,000 bbl. of oil daily.

This figure is almost exactly what all of Italy imported from Russia in 1959. In the first 7 months of this year, Italian imports of Russian oil averaged about 85,000 bbl. daily. Exactly how much of the new contract is a net addition to imports and how much will overlap on previous oil shipments is not yet clear.

Westerners have quoted the price of $1 a barrel, f.o.b. the Black Sea, pretty widely in their discussions of the new contract, but the Russians themselves have put no public price tag on the oil they plan to ship to Italy. The Italians have not talked prices either except to say the Russians offered "advantageous selling conditions."

The one thing the Italians emphasize—just a bit defensively—is that the deal will allow them to ship to Russia line pipe, pipeline equipment, and synthetic rubber "for a value corresponding to the value of the oil purchased."

Officials of the parties to the agreement have not specified the size of the pipe involved, but Russian visitors to the United States last month were talking in terms of 40-in. line pipe, which they themselves cannot make and which the U. S. Government will not allow them to buy in this country.

About all that is really known is that the pipe involved amounts to 250,000 tons and the synthetic rubber amounts to 50,000 tons.

European line-pipe manufacturers are now able to undersell American-produced pipe by about $20 a ton. This would make a large-diameter, high-strength line pipe produced in Europe worth from $160 to $170 a ton at the mill or a total of from $40 million to $42.5 million for the entire Russian order.

The Dalmine steel firm, a member of the combine which made the deal, is almost certain to be the fabricator of the pipe because it is the only company in Italy which can make large-diameter electric-weld pipe.

If, as Russia has hinted, the entire 250,000 tons of pipe should be 40-in., it would only amount to 222 miles of line (at 1,127 tons per mile for 40-in. o.d. by 0.750-in. wall). This is highly unlikely.

Western observers, more than a little alarmed at the Russian inroads in one of Europe's fastest growing markets, aren't too satisfied with the Italian attempts to reassure them that ENI isn't swinging all the way to Russia.

The new contract represents about 75% of ENI's current sales in Italy and ENI has about 20% of the entire Italian market.

The company which likes the whole deal the least is Jersey Standard, half owner with ENI and Stanic of 96,000 bbl. of refining capacity at Bari and Leghorn. In the past Jersey has furnished the feed for these two big refineries from its own sources.

To further placate the West, the Italians are quick to point out that Italian consumption is expected to double in the next 7 or 8 years and when this happens Russian imports will represent an even smaller percentage of the market.

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exports, by 1965, the Russian share of the same world demand will range from 5.1% to 7.5%.

On the face of it, these percentage figures may look large, but if the Russians achieve the higher range of exports, their over-all gain in the world market amounts to little more over the next 5-year period than they have been able to achieve in the past 4 years.

Russian trade agreements . . . The bulk of Russian oil exports today are included in bilateral trade agreements, many of which reflect downright barter agreements that would not be acceptable to private oil marketers.

The recent agreement with Italy's Ente Nazionale Idrocarburi is a good example of the Soviet-type agreement (see story above).

The fact remains that Russia has just about reached its limit in expanding exports to markets that are readily available to it.

Last year, the Russian share of the total demand in isolated markets ranged all the way from 95% in Finland, which is certainly an almost unique situation, to less than 5% in places like Argentina, Brazil, France, Great Britain, and Japan.

There is little Russia can hope to do in the future to expand the Finnish market on a large scale in order to dispose of appreciable volumes of crude or products. Because of geographic and political reasons, Finland is a natural market for Russian oil, but it is already pretty well saturated.

There is also little Russia will be able to do in the future to increase its minuscule share of the demand in places like France, Great Britain, and Japan. Each of these three possible markets is expanding at a far greater rate than the rest of the free world. Each has alternate sources of crude which will continue to be far more attractive than any Russian oil offer, in spite of a low price.

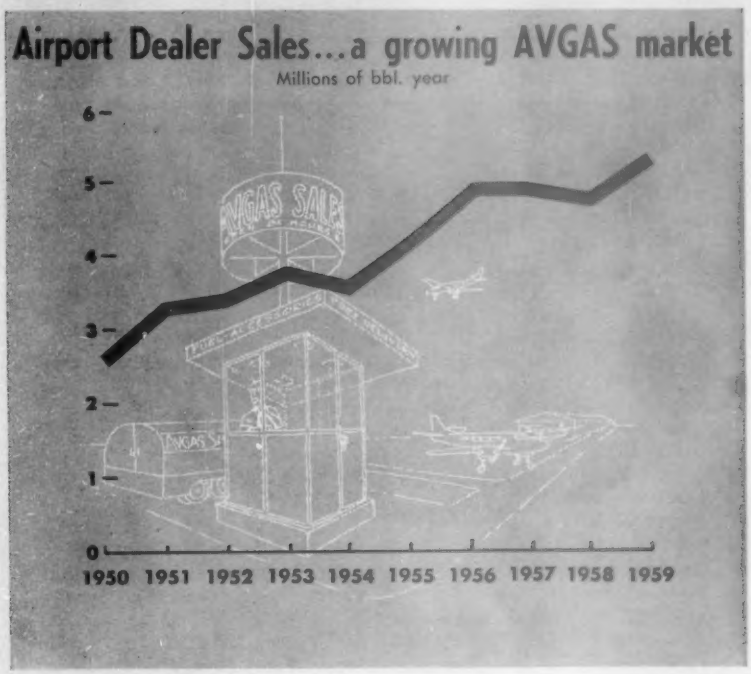
In short, Russia will have to depend on expanding its export market in the less developed countries that may be more amenable to political pressures which Russia may be able to bring to bear. But, in almost every case, the market potential, on a volume basis, is rising much more slowly than other regions.

India is a good example. The Indian Government signed a trade agreement with Russia to buy 1,500,000 tons of products over a 4-year period and has recently announced plans to increase the amounts substantially. But, when the Russians hurriedly shipped the first 11,000 tons of diesel oil to India for propaganda purposes, the Indians had no facilities for handling it—and more important, no customers for the fuel.

The Russians are in the oil market as competitors and they are going to try to increase their share of the market, but there is little likelihood they can resume their prewar position in the foreseeable future.

The Russian battle for export markets will come in places where they can use the utmost in political influence coupled with barter deals and below-market prices. These are regions where industrial development is so far behind that there is no large volume demand for oil as there is in other markets which the Russians cannot reach.

Airport Market Lures Avgas Suppliers



- Increasing use of small planes makes this field more attractive.

- Texaco has good results at quick service outlets in Canada.

THE MODEST volume of aviation gasoline sold through airport dealers is becoming large enough to sharpen competition among suppliers.

The increased use of business aircraft and other "itinerant" planes serviced by airport dealers is making this market more attractive. While domestic demand for avgas is declining because military and commercial airlines are moving into the jet age, sales through airport dealers are still growing.

Airport sales last year amounted to only about 7% of the avgas total. But the volume of 5,400,000 bbl. was double that of 1950, and it's enough to merit a more aggressive drive for this market.

The drive is built around a concept for better, more compact services to cut down ground time for aircraft. This idea is embodied in the "Sky Service Centres" which Texaco Canada Ltd. is using in Canada to test its marketing plan.

Results from the first outlets in Toronto and Montreal have been pleasing. Others are in the works for Winnipeg, Edmonton, Calgary, and perhaps Quebec later.

Because of Canada's great size, inadequacy of ground transportation in much of the country, and activity in remote areas, business aircraft are widely used. This makes Canada a good spot for testing an airport-dealer scheme.

A similar arrangement is under consideration for the United States. A relatively small number of outlets would be needed for exposure to a large segment of the business. Aubrey Kief, aviation sales director for Texaco, estimates 12 or 15 such outlets would provide excellent coverage.

PLASTIC MODEL of new "Sky Service Centre," designed to give special service to private planes, is examined by John Timmins of Timmins Aviation, Aubrey Kief, Texaco's aviation sales director, and A. Neil Lilley, president of Texaco Canada, Ltd. The first center, at Montreal, is operated by Timmins and Texaco.

Better service needed . . . Texaco approaches this specialized marketing problem with the idea that there is much room for improvement in airport services for corporate aircraft.

It is not uncommon for a plane

to be on the ground for an hour while it is being serviced, the bill is being prepared and paid, and traffic and weather checks are being made. The pilot often has to go to several offices scattered over a sprawling establishment to complete his business. And communication facilities are not always good.

This results in unwarranted loss of time on the ground, in part defeating the purpose for which expensive corporate aircraft are maintained. Men who ride such aircraft are accustomed to better service, and are impatient when it is below par.

On the theory that the company which identifies a quality product with top service will get the business, Texaco believes the "Sky Service Centres" provide this combination.

Airport service concept . . . The series of outlets is designed to provide uniform, quick, and efficient service at key airports.

Outlets are distinctive in appearance, easily recognized by a pilot looking for service, and will be identical in the various locations.

They offer one-spot fuel and lubricants service, plane-janitor service, catering service, teletype weather information, a direct line to the traffic-control tower, other communications facilities, and prompt accounting of the bill.

A licensed mechanic watches while the plane is being serviced to make sure it is done properly and the aircraft is not damaged. He also checks for any mechanical troubles, although repairs are not made by the dealer.

The pilot can be on his way again in 15 or 20 minutes, if he wishes.

When other centers are completed, they will be linked by teletype or other direct communication. The pilot can notify his next stop about fuel and other needs so he can be taken care of in a hurry. The trip is expedited, and cooperating dealers benefit as well.

The Toronto center has a conference room available to executives who want to have company meetings at the airport. Each executive who makes a practice of using the room is issued his own "golden key".

This feature has proved quite popular. Toronto-based firms have planned meetings around this convenient arrangement. They meet out-of-town people at the airport, conduct their business, and finish in time for travelers to return home the same day.

This makes possible the maximum use of executive time. Not only are commercial plane schedules bypassed; time loss between airport and downtown office also is eliminated.

watching WASHINGTON

Clyde La Motte

• Form charts are available on 87th congressmen . . .

A CURRENTLY POPULAR fad is the counting of noses of the new Congress to determine how it will vote on various issues.

For oil men, this nose count is usually applied to the likely lineup on percentage depletion, natural-gas legislation, a fuels-policy study, etc.

The normal procedure is to start with the voting records of the men still in Congress.

On some issues, such as a gas bill, it may be necessary to go back to 1955 when the Harris-Fulbright proposal was voted on. (Of 209 House members who voted for the bill, 123 will be back in 1961. Of the 203 against, 146 will be back.)

On percentage depletion, one needs to go back only to last summer for a Senate breakdown on that issue. (Of 61 who voted against a cut, 51 are returning. Of 34 who supported a cut, 32 will be on hand again.)

Once the returnees are classified, there remains the newcomers and their possible alignment. Here one has to depend on campaign platforms or other public expressions of opinion on a given issue.

The final step is to tally up the votes. Then you know how the 87th Congress is going to act on those issues in which you are interested.

Maybe.

• Don't depend too much on voting records . . .

VOTING RECORDS can be useful in giving some indication of what Congress may do, but this is by no means a foolproof approach because a congressman may change his vote.

And if, in 1961, some 1960 campaign promises are broken, it would not be the first time this had occurred.

A great many things can happen when time for actual voting on a particular bill approaches.

The administration can apply pressure on a congressman, especially one of its own party. And bear in mind that we will have a new administration next year.

Public opinion, aroused, can influence votes in a hurry. Remember how it swung many votes on economy and labor issues during the past 86th Congress.

And often, a congressman may do some horse trading, swapping his vote on some bill in which he isn't particularly concerned for a vote for a "pork barrel" bill he is sponsoring.

There are times, too, when a congressman feels he is forced to vote for a bill he doesn't like simply because there does not appear to be much of an alternative. For instance, some finally voted for a hike in the gasoline tax because it boiled down to a choice between that and slowing down the highway program or resorting to deficit financing.

• Many factors can cause a congressman to switch . . .

CHANGING SITUATIONS can change votes. In 1955, congressmen from "consumer" states were pressured to vote against the gas bill by gas-distributing companies, local regulatory commissions and a group of politically powerful mayors.

Since then, however, many of those who opposed the gas bill have come to realize that the present regulatory approach is doing the consumer more harm than good. So, when a gas bill comes up again, a number of congressmen may be getting different advice from back home.

Finally, in fairness, it should be noted that a congressman may change his vote because he has changed his mind after learning more about a given issue.

That is one large reason why the oil industry must keep everlastingly at the job of providing adequate information in Washington. That will be more useful than playing the game of nose-counting.

A SECTION of 36-in. pipe is coated at an Oregon pipe yard as U. S. work begins on the Alberta-California gas pipeline project.

Start Made on Huge Gas Line

. . . to herald the beginning of a 36-in. system that will move gas from Alberta's foothills to markets in the U. S.

THE FIRST PIPE was laid last week on the U. S. section of the Alberta - to - San Francisco natural - gas pipeline system being sponsored by Pacific Gas & Electric Co.

Only about 5 miles of 36-in. pipe is involved in the initial pipe-laying this side of the border. But the U. S. work, along with another 5 miles of line laid recently in Alberta, is the kickoff of a pipe-laying operation which will see from 10 to 12 spreads in the field next spring.

A spread working for a joint venture of Western Pipeline, Inc., Austin, and J. P. Neill Co., Inc., Dallas, laid the first pipe in the U. S. The spread is working in southern Oregon on the Pacific Gas Transmission Co. section of the system.

Another spread is scheduled to start laying pipe in northern California in mid-December. This spread will be operated by H. C. Price Co., Bartlesville, Okla. Price has the contract for the 291-mile California section of the system for Pacific Gas & Electric Co.

Construction on the 1,400-mile system is expected to hit a peak next May with the 10 to 12 spreads working. Activity will probably stay at a high level throughout the summer and autumn in an effort to make the final weld by the November 1 target date.

The big system is divided into four segments: PG&E's section in California; PGT's 614-mile section in Oregon, Washington, and Idaho; a 108-mile section in British Columbia which will be built by Alberta Natural Gas Co.; and 386 miles of line in Alberta which will be laid by Alberta Gas Trunk Line Co., Ltd. (OGJ, Aug. 29, p. 47).

As now planned, here's the way the spreads will be working during the peak construction period: One or two spreads will be working in California on the PG&E section; three or four on the PGT section; one in British Columbia; and five in Alberta.

In addition to the full spreads, special crews will be assigned to handle the smaller river and creek crossings and the highway, railway, and canal work.

Other work . . . Although only a small fraction of the total length of the line has been laid, pipeliners are busy along much of the right-of-way preparing for the big construction push next spring.

And some of the biggest pipeline equipment is being used on the system since all but 172 miles of the line is 36-in. pipe.

Ten pipe yards have either been set up or planned in the U. S. section of the system. Most of the pipe will be double jointed in the yards and some is being double jointed at the pipe mills. Double jointing was specified by Pacific Gas and Electric and the Bechtel organization, managing engineers for the system north of California (OGJ, Nov. 14, p. 116).

While crews are busy preparing right-of-way for the line, several pipe mills are simultaneously turning out pipe for the system. Just last week it was announced the first order for 20 miles of 36-in. pipe for the Alberta Natural Gas section had been placed with Well & Tubes, Ltd. The contract for another 87 miles of 36-in. will be announced soon.

Two U. S. mills will turn out the 910 miles of pipe for this side of the border. These two mills are Kaiser Steel's Napa, Calif., plant and the Provo, Utah, plant of the Consolidated Western Steel Division of U. S. Steel Corp.

More contracts . . . Contracts are scheduled to be awarded in the next 2 months for the major river crossings on the system.

Taylor Sees No Threat of Phillips Control

ANTITRUST policies of the Justice Department are expected to forestall any possible attempts of Phillips Petroleum Co. to gain control of Union Oil Co. of California.

Phillips has repeatedly disavowed any interest in taking over Union. Its purchases of stock amounting to 15% of Union shares outstanding, have been described as an investment.

Union Chairman Reese H. Taylor said last week that he doesn't expect Phillips to gain either direct or indirect control of his company.

"In view of the past actions of the government's antitrust division," Taylor said, "I would be very much surprised if Phillips would be allowed to gain or exercise control over our company or its management."

Taylor cited the fact that the two companies compete directly in many areas in the sale of petroleum products and chemicals. In these circumstances, the Justice Department would likely rule that a merger would tend to lessen competition, and thus would not allow it.

Record Set in Louisiana Lease Sale

• An 8-acre tract near Charenton field is sold for more than $26,000 an acre. And Shell makes a $2-million buy.

SHELL OIL CO. has paid $2,117,000 for a 2,085-acre tract of South Louisiana marshland near Bay Champagne field.

The price was the largest in an $8-million Louisiana lease sale, the first held since last February.

The eye-popper of the sale, however, was a $213,500 bonus payment, with 28% royalty, made by Tennessee Louisiana Oil Co. for eight acres adjacent to the Charenton field in St. Mary Parish. The price, $26,687.50 per acre, was the largest ever paid on a per-acre basis at a Louisiana lease sale.

Competing for the tiny parcel was Tennessee Texan Oil Co., which offered a $115,650 cash bonus with 50% royalty. The State Mineral board, in giving Tennessee Louisiana the lease, decided in favor of cash.

The small tract of water bottom land had been leased in the early 1930's and had two completed wells on it, but these went off production by 1943. Another lease, granted in 1947, expired while a lawsuit concerning the tract was pending. The lease is near Six-Mile Lake and the town of Charenton.

Shell's high-cost lease is in the Bay Champagne area of Jefferson and Lafourche parishes where several fields are located. The bid carried the standard one-sixth royalty.

The sale brought Louisiana a total of $7,973,439 for 77 leases on 68,411 acres of land. No offshore tracts were included in the sale, although many tracts were in the marshlands bordering on the Gulf of Mexico. Louisiana offered 139 tracts, but many had no bidders.

The board made no decision on when it will hold another sale.

Gas "Pool" Proposal Moves Forward

. . . as West Central Texas producers with shut-in reserves schedule meeting to tell prospective buyers about terms.

PRODUCERS with gas for sale in West Central Texas will get down to brass-tacks bargaining with potential buyers next week.

Roughly 50 operators, meeting November 16 with the gas committee of the West Central Texas Oil and Gas Association, agreed on the general components of an acceptable sales contract.

The committee will present these views to representatives of interested pipelines and plants at a meeting the first week of December.

The December meeting will be the latest move in a concerted effort by West Central Texas operators to obtain a market for large-scale gas reserves now shut in over a 13-county area (OGJ, Nov. 14, p. 104).

Reserves pledged by cooperating operators to any "reasonable" market continue to mushroom and now have reached roughly 650 billion cubic feet, according to Bill Tindell, chairman of the WCTOGA committee spearheading the drive.

The West Central Texas group has been in contact with 16 interested gas buyers — including 13 pipelines and three gasoline plants.

And at least two major lines, reportedly Transwestern Pipeline Co. and Natural Gas Pipeline Co. of America, were said by Tindell to be "ready to extend lines into this area as soon as available reserves reach 750 billion cubic feet."

Take-or-pay sought . . . It appears now, based on the November meeting, that the producer group will bargain hard for a minimum take-or-pay clause in any negotiated contract.

The group feels this will be necessary to provide the producers with a reasonable payout of drilling costs and with sufficient market to stimulate exploration and development.

No specific price has been mentioned.

The number of producers interested in participating in the sought-after new market has climbed to 46 from the total of 43 earlier this month. And the shut-in reserves during the same period increased more than 150 billion cubic feet.

Counties involved in the project include: Brown, Callahan, Coleman, Concho, Comanche, Eastland, Erath, Jones, Palo Pinto, Parker, Stephens, Taylor, and Young.

Three New Lines to Serve Mid-Continent

TWO active Mid-Continent producing areas, the Hennessey and Dover fields in Kingfisher County, Oklahoma, and the Ackman and Sleepy Hollow fields in Red Willow County, Nebraska, will be served by three new pipelines.

Longest of the three is the 60-mile, 6-in. and 7-in. system which Rock Island Oil & Refining Co. is building to serve the Red Willow County fields. It will tie in a compact gathering system in these fields with the Colby, Kans., station of Arapahoe Pipe Line.

The line will have six pumping units, three in the Ackman field and the others at individual points in the system.

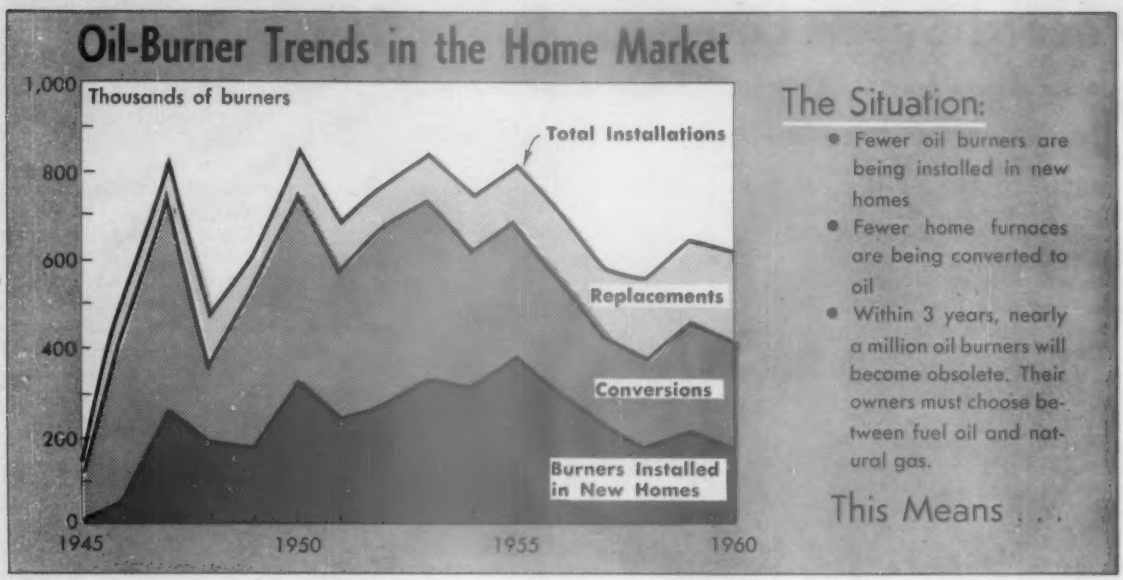
Three contractors are working on the line, which is expected to be completed by the spring of 1961. They are Gilmore Construction Co., of Hays, Kans., Plains Construction Co. of Kimball, Neb., and Barney Bridges, Ardmore, Okla.

Champlin Oil & Refining Co. is building one of two lines to serve Hennessey and Dover fields.

The principal portion of this system will be a 6-in. gravity line from a point northeast of Hennessey to the Champlin refinery at Enid. There will also be an 11-mile, 4-in. discharge line and a 10-mile gathering system to serve North Dover field.

Sadler Bros. Pipeline Construction Co., Oklahoma City, is the contractor. Engineering and design work was done by Paine & Associates of Enid.

Continental Pipe Line Co. is building the second line to serve South Dover, Mid Dover, and North Dover fields, as well as the East Hennessey region. This 32-mile line will connect with Continental's existing line which takes crude from the Crescent pool area of Logan County.



A Crisis in Fuel-Oil Sales is Brewing

• A home burner lasts 16 to 18 years. We're getting close to the time when a big batch of furnaces installed in the late '40's will have to be replaced. If the fuel-oil dealer expects to win this market, he'll have to move now.

FUEL-OIL dealers in the home-heating market face a real selling crisis in the next 3 years.

The reason is simple: Thousands of central oil-heating units sold shortly after World War II are beginning to wear out. The first big slug of these reach the critical obsolescence period in 1963.

The time when a customer is most likely to change from oil to gas or electrical power is when his burner goes out and has to be replaced. He becomes a potential customer for the salesman of some other form of automatic heat.

The fuel-oil salesman must start making his plans and even his sales pitch now. If he waits until the big replacement flood starts, he may drown in the stream of contract cancellations.

Size of the market . . . The average life of an oil burner is about 16 to 18 years.

Best statistics available show that more than 800,000 oil burners were installed in 1947 and more than 7,000,000 were installed in the 1947-56 period.

Those installed in 1947 will be nearing the end of normal service about 1963. Some sources estimate that at least 4,000,000 burners will have to be replaced by the end of 1970.

Fuel-oil salesmen have several selling points on their side that may help persuade a customer to replace his old burner now instead of waiting. For example:

. . . **Why wait** for the old burner to gasp its last during the middle of a cold spell when the home owner will have to make a frantic and costly replacement?

. . . **Economy.** New burners are more efficient and will return the householder profits in comfort, convenience, and economy.

Some companies have done important work in burner research, and an industry research drive is just now gathering steam. More efficient and compact burners will come on the market in the years ahead. They should make replacement increasingly attractive.

Irony of this for the fuel-oil dealer is that replacement-burner sales actually represent a slight loss of distillate demand. The new burners do the same heating job with less oil.

But the fuel-oil dealer has no other choice if he wants to stay in business. His hope is that the more efficient burner will help him in getting some business away from gas or electricity salesmen.

Fact that this can be done was displayed before the fuel-oil committee of API's Marketing Division in Chicago. A New York dealer told of his success in persuading home owners in Levittown, N. J., to switch from gas to oil burners (OGJ, Nov. 21, p. 133).

A dealer with efficient burner serv-

PROCESSING

Tidewater Oil Co. has let contract for the construction of a Delaware naphthalene plant to Catalytic Construction Co., Philadelphia. Plans call for the plant, which will have an initial capacity of 100 million tons per year, to be completed late in 1961. Built adjacent to the company's 150,000-bbl. refinery near Wilmington, the plant will be a joint Tidewater-Collier Carbon & Chemical Corp. venture. A Union Oil Co. process for converting alkyl naphthenes into high-purity naphthalenes will be used.

A new gas-processing plant will be built by Westcoast Transmission Co. Ltd. on a 200-acre tract 4 miles east of the Alberta-British Columbia boundary. Project manager for the operation will be Canadian Bechtel Ltd. Westcoast Transmission will export

ice and inspection can set the time for effective sales promotion. He can anticipate when replacement will be needed. Aggressive action can save a large part of this replacement market and assure normal gains in heating-oil sales.

Trends . . . The charts show clearly the statistical trends in central oil-burner installations:

. . . **New homes** provide a declining market for oil burners.

. . . **Conversions** from another source of fuel also are dropping.

. . . **Replacement** of obsolete burners already is gaining.

. . . **The yearly increase** in the number of central oil burners in use is on the upswing again. While the total has increased each year, the size of the gain has been pretty small since 1955.

The fuel-oil industry came into its own after World War II. A pent-up demand had been created by restrictions on building and fuel.

As soon as building materials became available, construction of new homes spurted. In the northern and northeastern areas, there was a switch to automatic heat. Oil burners and distillate fuel filled the bill.

Until 1955, new homes provided an increasing market for fuel-oil burners. These installations jumped from almost nothing in 1945 to more than 350,000 in 1955. The level still held at 250,000 burners in 1957, but the drop appears to be leveling off in the last 2 years.

The burners for new homes, however, have accounted for only a part of the increases in demand for distillate fuels. Many home owners shifted from coal to oil in the early postwar period.

Peak of conversions was in 1947 when about 500,000 customers shifted to oil from some other fuel—probably coal. The conversions also show a decline since 1955, due mostly to the impact of natural-gas sales.

Burners installed as replacements have been a growing factor only since 1955, and their volume has been increasing especially since 1957.

Burners for new homes and for homes converting to oil actually overstate the new market for distillate fuel. Their total does not take into account some of the old oil customers who have shifted from oil to gas.

One oil company estimates that for the 10 years 1946-55 the net gain averaged almost 590,000 burners per year. For the last 4 years, the net yearly gain has been less than 350,000.

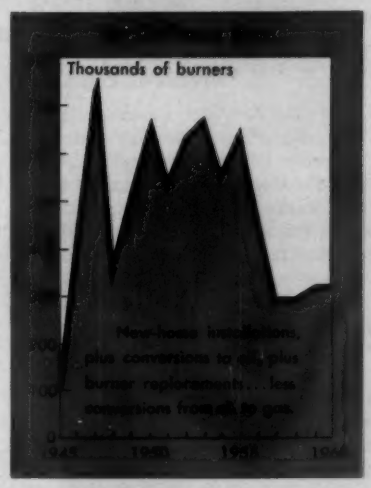
And the future net gain will be lower unless fuel-oil salesmen make a vigorous attempt to capture the upcoming replacement market.

Fuel-oil market is growing, but more slowly

FIGURES on the installation of home oil burners can be misleading unless account is taken of former oil customers who have switched to gas. These losses must be subtracted from new-home and conversion sales to determine net additions to the oil-burner list.

The chart shows how net additions have fluctuated in the postwar period. Following a sharp drop in 1955, the additions have pushed upward slightly but the rate of climb is far below that of some previous years.

When the big wave of furnace replacements hits, fuel-oil dealers will have to work hard to avoid the possibility of even slower gains.


Thousands of burners
New-home installations, plus conversions to oil, plus burner replacement . . . less conversions from oil to gas.
1945
1950
1955
1960

BRIEFS . . .

natural gas from the Savanna Creek field north of Coleman.

DX Sunray has moved into mid-Mississippi territory through purchase of the marketing facilities of Goyer Oil Co., Greenville, Miss. DX marketing had been limited to northern Mississippi. Purchase includes 6 bulk plants, 16 service stations, Mississippi River terminal facilities, and undeveloped properties. Details of the purchase agreement were not disclosed. DX will take over operations November 30.

A contract for designing and engineering a pilot plant to produce stereospecific synthetic rubbers has been awarded by General Tire & Rubber Co. to Crawford & Russell, Inc., Stamford, Conn. The plant, at Mogadore, Ohio, will use special reactors in both continuous and batch polymerization of isoprene and butadiene.

Construction now under way at Amoco Chemicals' Joliet, Ill., plant will boost the company's dimethyl terephthalate capacity by 50%. The product's principal use is as an intermediate in the manufacture of polyester films and fibers. Construction should be completed in August 1961.

Tidewater has entered the retail LPG field through buying controlling interest in Vangas, Inc., Fresno, Calif. The company will market in four western states with part of the product coming from the Avon refinery near San Francisco and a gasoline plant at Ventura. Tidewater acquired Vangas' stock at the rate of $18 for common and $54 for preferred.

Petrochemical manufacturing facilities of Canadian Oil Companies, Ltd., will be expanded with a $750,000 installation at the firm's Sarnia refinery. The new facility will double benzene production to 7,000,000 gal. annually. Work is starting on a Hydeal unit for converting toluene to benzene for use in making plastics and synthetic rubber.

Paraxylene capacity at Humble Oil & Refining Co.'s Baytown, Tex., refinery will be increased from 65 to 105 million pounds annually. The expansion is expected to be completed by the end of the first quarter of 1962.

A sulfur recovery plant has been opened near Tilden, Tex., by Trans-Jeff Chemical Co. The new company, formed by Transcontinental Gas Pipe Line and Jefferson Lake Sulphur, is studying the feasibility of adding facilities for the production of other chemicals.

Monterey Sale to Humble Nearly Final

• Purchase approval expected next month, effective date December 31. Deal involves cash and oil payments, does not include Transwestern stock.

THE SALE of Monterey Oil Co. to Humble Oil & Refining Co., rumored for months and confirmed only a few weeks ago, is expected to be approved at a special meeting of Monterey stockholders December 22.

Details of the long-discussed sale were revealed last week when Monterey mailed a proxy statement to stockholders.

The statement disclosed some interesting information—including the fact that the deal involves a $72-million production payment which will take Humble from 8 to 11 years to repay.

Here's how the production payment works:

A group of investors has organized three companies which will pay Monterey $72 million for oil in the ground. Humble will acquire this production payment and repay the investors with production from the properties bought from Monterey.

According to stipulations of the deal, Humble is pledged to repay the $72 million with not less than 69% of the production from the Monterey properties. Some small properties are not involved, but all big producing leases now held by Monterey are included.

In effect, this means the investors initially will have first call on 69% of Monterey's production and Humble 31%, but once the payments are satisfied, all production goes to Humble.

The investors turn a neat profit in the deal. They are borrowing the $72 million at a 5% interest rate, but the production payments carry an interest rate of ⅛% on the unpaid balance so they net annually ⅛ of 1% of the ceiling balance. Figuring $72 million as the unpaid balance, the investors' ⅛ of 1% would total $90,000 the first year.

Chase Manhattan heads a group, including First National City Bank and Morgan Guaranty Trust of New York, which is lending $72 million to underwrite the production-payment deal.

Investment companies set up to buy oil payments are Albantu Oil & Gas Corp., owned by a group of employes of Lehman Brothers and affiliates; Cosmopolitan Oil Corp., and West Wall of Delaware, Inc., owned by various investors with oil and other interests.

What Humble Is Buying

(All figures as of August 31, 1960)

	ANNUAL PRODUCTION		RESERVES	
	Crude (bbl.)	Gas (M.c.f.)	Crude (bbl.)	Gas (M.c.f.)
California*	2,775,783	1,355,511	20,821,680	15,464,980
Louisiana	34,629	1,524,201	2,211,150	44,419,540
New Mexico	153,044		1,675,950	
Oklahoma	3,756		9,970	
Texas*	1,566,278	2,010,971	34,822,740	14,535,270
Wyoming	437,498	32,450	4,353,070	524,460
Total	4,970,988	4,923,133	63,894,570	74,944,250

*Figures for California and Texas include production payments made during year. Last production payment made in September. In reserves figures, condensate is included with crude, but casinghead gas not included in gas figures.

With this big production payment, Humble will be able to buy Monterey though paying only $34,425,000 in cash, or only approximately 29% of the company's total assets of $118,300,000.

What's not involved . . . The $118-million in assets includes Monterey's holding in Transwestern Pipeline Co., but Humble is not expected to buy Monterey's Transwestern stock. Monterey's present plan is to distribute the stock among stockholders, but there is a good chance the stock will be sold.

Transwestern stock is traded over the counter and recently was quoted at $12.50 a share. Monterey holds 950,000 shares, which would be worth $11,875,000. This represents approximately 15% of the outstanding Transwestern common stock.

The only other properties not included in the sale to Humble are Monterey's 25% interest in an offshore block now under development off Santa Barbara County, California, and the company's undeveloped leases in Alaska.

The offshore lease is held jointly with Texaco Inc. and Newmount Oil Co. The lease brought a bonus of $23.5 million at a 1958 lease sale. Production has been established on the acreage, but has been shut in until pipeline facilities are justified.

Humble is committed to buy this offshore interest for $1,800,000 if it is not sold to another party by October 31, 1961. The Alaskan holdings include leases or options on 290,440 acres in the Bristol Bay area. Part of this acreage is in a block where Mobil Oil Co. drilled two dry holes. The company plans to quitclaim these leases if they are not sold.

What's involved . . . In buying Monterey, Humble will get a daily crude production of 13,619 bbl. and primary reserves of oil and condensate estimated at 63,894,570 bbl. The production is scattered in six states, but includes 7,604 bbl. daily in California, where Humble has been beefing up its operations.

The Monterey purchase is considered part of Humble's long-range plan to become an integrated oil company in California.

INDUSTRY

Suntex Petroleum, Ltd., has been created as a subsidiary of Texam Oil Corp., to hold the parent firm's Canadian properties. Suntex will take over Texam's interests in 235,000 net acres in western Canada and its proved reserves of more than 1,000,000 bbl. of oil and natural-gas liquids and 10 billion cubic feet of gas. The subsidiary also will take over Texam's 25% working interest in about 2,000 acres in the Sundre area.

Flaring in the Lisbon oil field in northern San Juan County, Utah, has led the Utah Oil and Gas Conservation Commission to order a "show cause hearing" on why the field should not be shut down. The hearing is scheduled November 29. Simultaneously,

Humble has had producing and exploration offices in California since 1948, but only last summer moved into retail marketing. And it is expected some day to get into refining—and the crude from Monterey's leases will give the company a substantial crude supply.

Humble's current crude production in California is about 8,700 bbl. daily. However, what Monterey considers its prize producing property is its 19.7% ownership in the Fullerton-Clear Fork unit in Andrews County, Texas. The unit includes 622 wells and produces about 8,000 bbl. daily. It has been estimated the Fullerton unit will produce an additional 175 million barrels of oil.

In California, Monterey's production is in several fields, but one of its better leases is an offshore lease at Seal Beach. The company owns the lease jointly with Texaco.

The property is on the southern edge of Wilmington oil field, California's biggest.

The Seal Beach operation includes 35 wells which net Monterey 1,250 bbl. daily.

Most of the company's California crude is sold to Union Oil Co. under a long-term contract. The contract carries a 1-year cancellation clause if the company is sold.

In addition to production in Texas and California, Monterey also has production in Louisiana, Oklahoma, New Mexico, and Wyoming.

Schedule of events . . . Under the plan worked out by Humble and Monterey executives, the sale will be closed early in January with an effective date of December 31, 1960.

The first payment to stockholders is to be made about February 1. This payment will come to about $40 a share, including a $6-a-share allowance for the Transwestern stock.

However, this amount could grow if some kind of deal is made to sell the block of Transwestern stock. And this is a lively prospect because several companies are known to be interested in getting into the booming natural-gas market in California. Transwestern recently started moving gas to California through a 1,400-mile line from Texas.

A second stockholders' payment will be made around November of next year. This will cover what is realized from the sale of the offshore California and Alaskan properties. Once this payment is made, Monterey assets will be gone and it will be dissolved.

As far as the properties acquired by Humble are concerned, these are expected to change hands on the effective date of the sale. Humble plans to operate the properties as the Monterey Division of Humble Oil & Refining.

The special stockholders' meeting December 22 will have a dual significance for Monterey since it will be the tenth anniversary of the founding of the company.

Howard C. Pyle has headed the company since 1951 and has been instrumental in negotiating several deals which have seen Monterey grow to its present size. Board chairman of the company is Frederick L. Ehrman and the executive vice president is John R. McMillan.

Permian Takes Over Cactus Petroleum

PERMIAN CORP., a Midland, Tex., crude marketer, has taken over the assets and operations of Cactus Petroleum, Inc., a Houston crude marketer.

The two companies buy about 115,000 bbl. of crude daily in seven states.

Cactus will be a division of Permian for the present. Eventually the operations of the two companies will be meshed, with headquarters at Midland.

Permian President W. R. Davis will continue as president of the company, while Cactus President W. D. York will be a member of the board of directors. York owned nearly all of the Cactus stock and received both cash and substantial stock in Permian in the merger.

Vice presidents of Permian are W. L. Kleine, Midland; George Nolley, Tulsa; and E. S. Brooks, T. D. Jenkins, and M. W. Sublett, all of Houston. Brooks and Jenkins formerly were Cactus officers.

Before the merger Cactus had been purchasing about 75,000 bbl. daily of crude and condensate from producers in Texas, New Mexico, Kansas, Oklahoma, Louisiana, Mississippi, and Alabama and moving it by pipeline, truck, and barge. Permian's buying consisted of about 40,000 bbl. daily in Texas, New Mexico, and Louisiana.

A spokesman said the companies merged to eliminate duplication of effort, to operate more efficiently and to provide better service to customers.

BRIEFS . . .

the agency deferred a Lisbon spacing hearing from December 9 to January 10 to let operators have more time in which to agree on area unitization.

Kansas will retain in December a crude-oil allowable of 300,000 bbl. daily, the same as in November. Crude-oil purchasers had suggested that the Kansas Corporation Commission set a December allowable of 304,631 bbl. daily.

A working interest in 16 oil wells in Tillman County, Oklahoma, has been exchanged by King Oil, Inc., Wichita Falls, for an undisclosed amount of stock in Kutz Canon Oil & Gas Co., Denver. Directors of both firms have agreed to move toward a merger. King Oil has interests in more than 800 oil and gas wells in four states, while Kutz Canon properties are in the Four Corners area and Wyoming.

A record oil allowable of 73,115 bbl. daily has been set for North Dakota in December. The previous high allowable set by the state's Industrial Commission was 71,980 bbl. a day in November.

The only bidder for oil and gas leasing of 14 tracts on Indian land in San Juan County, Utah, was Union Oil Co. of California. The firm bid $4.76 an acre for about 1,325 acres.

Thirteen new Humble Oil & Refining Co. service stations will be operating soon in four Ohio cities. Humble announced the start of a service-station development program in Ohio last spring. Six of the new stations are being built in Youngstown, two in Alliance, three in Columbus, and two in Zanesville. The first Humble station is nearing completion in Youngstown and is expected to open about December 1. All of the stations will be operating by January.

A hearing will be held by Louisiana Conservation Commissioner James Gill at New Orleans December 9 on the state's oil allowable for January and February, and on the natural-gas allowable for the first quarter of 1961. Field hearings also are scheduled on rules and units for certain sands in the southeast part of Bastian Bay field and the Celotex sand in Bayou Segnette field.

Companies Bid for Honolulu

HONOLULU Oil Corp., the San Francisco producing firm which is on the sales block, has received a "substantial" number of offers from prospective buyers.

A company spokesman said all offers that will be considered by the company have been received, but indicated it would be next March or April before the sale is wrapped up.

Among the prospective purchasers are Union Oil Co., Pure Oil Co., Continental Oil Co., and Standard Oil Co. of California.

The Honolulu management announced several weeks ago the company is for sale if the price is right. It will be a one-package deal covering all the company's assets.

The company declined to reveal just who is bidding or how many bids have been made, but a spokesman said "there has been a considerable amount of interest and a substantial number of companies" have made offers.

It was reported a January deadline has been set for firm offers. After all offers are in, the company will study these, then start negotiations toward closing some kind of deal.

Company's assets . . . Honolulu is a producing and exploration firm which produced a daily average of 43,300 gross barrels of crude in 1959. Gross gas liquids production for the year was 3,203 bbl. daily.

The company's production is spread out through the Mid-Continent area, the Rocky Mountains, California, and Alberta. The Mid-Continent production totaled 17,600 bbl. daily in 1959 while California production came to 13,900 bbl. daily.

Honolulu's Rocky Mountain production took a big jump in '59. Gross output soared from 800 bbl. daily in 1958 to 5,900 bbl. daily last year. This Rocky Mountain production is expected to average even more in 1960 since a crude line was finished from production Honolulu has in Fourbear and Pitchfork fields in Wyoming. The line moves crude 28½ miles to Platte pipeline.

Texas Offshore Test Is a Dud

OFFSHORE Texas drillers have chalked up another disappointment. And this was a big one.

Shell Oil Co. went to 16,091 ft. before abandoning a wildcat on 5,760-acre tract that cost nearly $6 million in last February's federal lease sale.

But the company is trying again—this time on a tract it owns jointly with Mobil Oil Co.

Shell is not saying what, if anything, it found in the hole it has plugged. But apparently there was nothing of major significance.

Located in federal Block OCS-288, 31 miles south of Galveston, the well was projected originally to 10,000 ft. (OGJ, Aug. 29, p. 58). The operators went past 16,000 ft. before quitting.

Still trying to find big oil off Texas, Shell ordered the rig—the Vinegarroon of Zapata Off-Shore Co.—moved to Block 236, purchased last February by Shell and Mobil jointly. The well is about 18 miles northeast of the Block 288 well.

Shell is the largest leaseholder in offshore Texas, an area which has shown only limited quantities of oil despite the fact that some of the nation's major reserves are located at onshore sites nearby.

Two Dusters Keep Georgia Record Intact

TWO MORE wildcats in Georgia and one in eastern Alabama have produced only dry holes, but another well will be spudded shortly in Georgia.

Humble Oil & Refining Co. last week was abandoning its Wayne County test 7 miles north of Gardi in the southeastern corner of Georgia.

At 4,547 ft. it had drilled unexpectedly into metamorphic basement rocks, which limit Georgia's potential for oil exploration along the Atlantic Coast. This depth was more than 5,450 ft. short of its target depth of 10,000 ft. Location was on a lease spread of 750,000 acres.

Humble said its well was the ninety-fourth dry hole drilled in Georgia since 1938. There has not been a producer yet.

Although it failed in the southeast, Humble is preparing to test again in the extreme southwest (OGJ, Oct. 3, p. 69). It plans to spud this well early in December in Seminole Lake, less than 3 miles north of Woodruff Dam on the Florida-Georgia border. Drilling will be done with a rig now being barged from the Gulf of Mexico through Apalachicola River.

Meanwhile, C. H. Cutler, Houston independent, reported dusters 50 miles apart in western Georgia and eastern Alabama (OGJ, Oct. 17, p. 70). Neither well went to great depth and both found granite.

The Georgia well was about 5 miles southwest of Geneva in south Talbot County, and the Alabama well about 2 miles west of Marvyn in Lee County.

Fracture Rulings

. . . to be studied by Texas Supreme Court in January.

THE Texas Supreme Court has agreed to decide a hot legal question in Texas—whether the courts or the Railroad Commission should govern property rights when gas wells are fractured across lease lines.

The issue now is cloaked with confusion.

In one instance, an appellate court in San Antonio earlier this year ruled that a district court erred in forbidding an independent operator to fracture a small tract well in the city of Pharr in Hidalgo County. The district Court had ruled that such treatment would extend fractures across lease lines and would constitute trespass.

However, a second appeals court in Austin went the other way to hold that the courts do have jurisdiction. And, in the process, it overturned a district court decision holding the Railroad Commission to be the proper authority.

All suits were filed originally by Delhi-Taylor Oil Corp. and Mayfair Minerals, Inc., against town-lot drillers in Pharr-McAllen gas field to stop fracturing operations.

Defendants are A. W. Gregg, Christian A. Holmes, and William Dugger.

The Supreme Court has set oral argument for January 4.

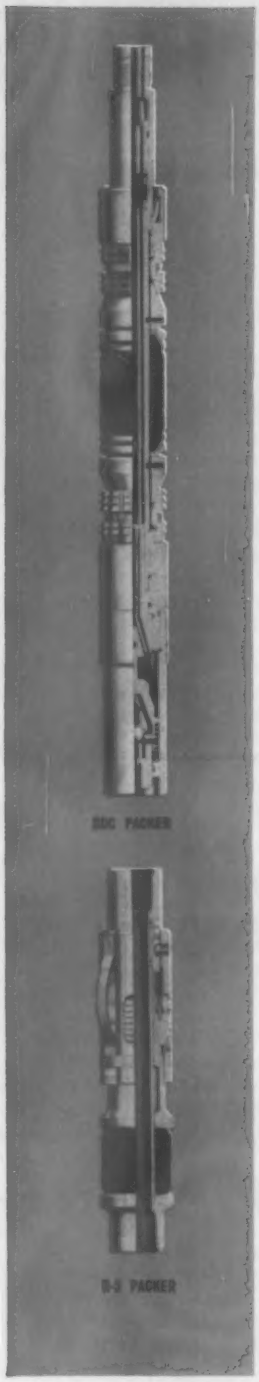
Big Calgary Gas Plant Set

A $13-MILLION gas-processing and sulfur-manufacturing plant will be constructed 15 miles northeast of Calgary by Jefferson Lake Petrochemical and Mobil Oil of Canada.

The plant will have an annual production of 285,000 tons of sulfur, 700,000 bbl. of condensate, and 36.5 billion cubic feet of pipeline gas.

Because of the new facility, some 30 companies plan to spend about $2 million in development drilling in the 200-sq.-mile Calgary field.

Target date for the plant to go on stream is November 1961.



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...WITH HALLIBURTON'S SDC AND R-3 PACKERS

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HALLIBURTON SDC PACKER *for 2-7/8" O. D. tubing*

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The R-3 Packer is a short, compact, full-opening, retrievable tool, which can be run as an inverted hookwall packer for tension-set tubing in relatively shallow wells – or a conventional packer used with a by-pass – being set by tubing weight applied. The R-3 consists of a packer rubber, conical wedge, drag springs and mechanical type slips mounted in a sleeve with a J-slot locking arrangement.

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Showdown Seen on Import Controls

• Look for an early decision by Interior on whether to put its proposed changes into effect, modify them, or discard them. Last week's hearings gave plenty of reason to move in any direction.

A MAJOR SHOWDOWN on the oil import control problem appears in the offing.

This may include a challenge in court of the authority of Interior Department to make changes in the basic structure of the program without a special study and recommendation by the Office of Civil and Defense Mobilization, since that was the procedure followed when the program was originally established.

Two basic questions are involved: Whether there should be any change in the level of imports and whether there needs to be any change in the way quotas are allocated.

Much was said on both subjects last week during a hearing held by Interior Department on rule changes that had been proposed earlier by the department.

On the issue of import levels, producer groups insisted that crude-oil imports must be reduced further—even below the reductions that would result if Interior's proposals were adopted.

Others, principally international oil companies, feel that the present program has provided sufficient protection for the domestic producing industry and that no further cut is justified.

On the issue of the mechanics of allocations, several proposals were made by industry representatives.

The one given most emphasis was that company quotas be based entirely on refinery runs. This would mean elimination of the minimum now provided for historic importers of crude oil.

1. Import levels

Clearly, the basic issue is the determination of the over-all level of imports needed to keep the domestic industry healthy.

Up or down? . . . At the hearing last week, independent producers renewed their plea for a further cut in imports. They approved what the Government has done thus far but said that changing conditions now call for more corrective action.

They cited area-by-area evidence that conditions are steadily worsening for domestic producers. For proof, they pointed to declines in exploration, drilling, production, and oil-field employment.

Opposition—led principally by integrated, international companies — to further cuts was based primarily on the argument that such cuts are not needed at this time.

They did not deny that there has been a slowdown in producer activity. But they contended this was to be expected in view of industry conditions as a whole and that it was not detrimental to the nation's defense.

This was the general line of reasoning of this group:

The rate of domestic drilling and production expanded at an abnormally high rate in recent years. Meanwhile, demand for crude and products slowed down.

As a result, the producer segment of the industry—as well as other segments—must readjust to the slower expansion pace and offset past "excesses."

Furthermore, other factors indicate that a decline in drilling rates below past record levels does not necessarily mean that this country's producing capacity is worsening.

For one thing, efficient producing practices, including wider well spacing, simply mean that fewer wells are required to develop a given capacity.

Also, greater use of secondary recovery methods, not dependent on well completions, provides an alternative method of expanding reserves.

Natural-gas liquids . . . It was evident that a key point that still must be settled is the weight which should be given to the increasing production of natural-gas liquids when import levels are being determined.

Producer groups say this increase is adding to domestic crude producer problems because it is taking away crude-oil markets. As a result, domestic crude demand is remaining static even though over-all demand is increasing.

Their, point, too, is that this impact of natural-gas liquids should be distributed, and not borne solely by the producer segment. That is, import levels should be reduced to include this factor.

On the other side of the fence, some major company spokesmen argued at last week's hearing that such a line of reasoning is full of holes.

For one thing, they say that national security—the basis for the oil import control program in the first place—is not adversely affected by the increase in natural-gas liquids.

They argue that from a national security standpoint it is not important whether available energy is in the form of crude oil or natural-gas liquids.

Second, they point out that the source of natural-gas liquids and of crude oil is the same, so that the domestic producer benefits from the increase in natural-gas liquids from his wells to offset any loss in crude-oil sales.

Their conclusion, therefore, is that a cut in crude-oil imports cannot be justified on the grounds of national security and that, anyway, the producer's plight is not as bad as some producer associations have sought to portray.

2. Mechanics of controls

Aside from the dispute over a necessary level of imports, there is a wide difference of opinion on how quotas should be distributed.

Basis for quotas . . . The Independent Petroleum Association of America has proposed that the ratio of crude-oil imports be tied solely to crude-oil

PIPELINE

Texas Eastern Transmission Corp. has been granted a temporary authorization by the FPC to proceed with $17,592,000 worth of construction. It includes 66 miles of 30-in. loops between Vidor, Tex., and Lambertville, N. J., and the addition of 33,710 hp. in four existing compressor stations. The additions would enable Texas Eastern to increase its deliveries by 51,002,000 cu. ft. per day.

Great Lakes Pipe Line will supply the new petroleum products terminal which Continental Oil Co. and Sinclair Refining Co. will build at Lincoln, Neb. The terminal will cost $330,000 and will have four storage tanks with a capacity of 1,680,000

demand (OGJ, Nov. 21, p. 146).

IPAA got strong backing at the hearing from the Texas Independent Producers and Royalty Owners Assn. And from a liaison group of producer associations.

The reason for the switch from the present method of basing import levels on total demand to a domestic crude-oil demand, as the producers see it, is this:

Product demand has risen faster than crude demand, chiefly because an increasing share of product demand is supplied from such non-crude sources as natural-gas liquids and the increased shipments from District 5 into Districts 1-4.

The result is that the ratio of imports (excluding residual fuel oil) to crude-oil demand has risen appreciably. This discourages development of domestic crude-oil sources and means, in effect, that imports are able to increase more rapidly than domestic crude-oil production.

Refinery runs . . . There was even more discussion over whether individual quotas should be based solely on refinery runs or whether historic importers should continue to get protection.

There was considerable difference of opinion on this question, even among the major companies.

Some of the majors, even those with historical quotas, indicated they would not strongly oppose such a move. Others, however, insisted that a switch to refinery runs alone would give companies who have never gone abroad an undeserved advantage of an import quota.

Most independent refiners, especially those with inland plants, strongly supported the refinery-run basis. For them, it would mean higher import quotas.

Producers are less concerned over the issue, although IPAA has said that it favors such a change.

There was more agreement between the larger integrated companies over a proposal that the sliding-scale formula should be abandoned so that a specified per cent would apply to all, regardless of size. As it is now, small refiners get a higher per cent figure than that applied to the larger refiners.

Legal roadblocks . . . Several of the larger companies raised the question of the legality of any move by Interior which would result in a cut in imports.

Spokesmen for Texaco Inc. were strongest on this point. They said the original control plan was developed after a study by a special cabinet committee and after a recommendation had been made to the President by OCDM.

Therefore, they argued, any basic changes in the plan should follow the same course, including public hearings on specific proposals. Otherwise, they said, any changes would be illegal.

Texaco made it clear that it is seriously considering an appeal to the courts if the changes are made otherwise.

Producer groups insisted, however, that Interior is clearly within bounds of its authority in making such changes as are needed to carry out the intent of the program.

3. Interior's proposals

Almost overshadowed by the many points raised at the hearing was the fact that the hearing was called to discuss a specific plan which Interior had announced recently.

Interior's plan, which it wants to put into effect January 1, proposes three steps by which import levels would be reduced by a total of about 60,000 bbl. daily. The import level would be reduced by:

. . . Thirty per cent of the amount by which residual fuel oil imports in the January-June period of 1960 exceeded the residual import level in the same period of 1959.

. . . The amount by which shipments of crude, unfinished oils, and products shipped from District 5 into Districts 1-4 in the preceding allocation period exceeded such shipments during the corresponding period of 1958.

. . . The level would also be decreased, or increased, by 9% of the amount by which estimated total demand fell short of, or exceeded, actual demand. The purpose of this adjustment would be to correct inaccuracies in Bureau of Mines forecasts.

At the hearing last week, a lot of opposition was voiced to these proposed changes, particularly to the first two.

Looking ahead . . . It appears to be Interior's intention to make a decision soon as to whether to put the proposed changes into effect, modify them, or discard them.

If Interior does decide to make changes, a revision of the presidential proclamation will be required. Thus far, there has been no indication from the White House as to what may be done, although it is generally considered likely that the President will approve the changes planned by Interior.

BRIEFS . . .

gal. It is expected to be completed about February 1.

Algonquin Gas Corp. has been given a tentative okay by FPC to add a 6,000-hp. compressor unit at its Stony Point, N. Y., station. The estimated cost is $2,465,600. The added compressor capacity will let Algonquin up its delivery schedule by 14,832,000 cu. ft. per day.

Trans Mountain Oil Pipe Line's deliveries were down sharply in the third quarter but, for 1960 as a whole, were well above 1959. Deliveries averaged 115,915 bbl. per day in 1960 against 97,779 bbl. in 1959. This year 44.43% moved to refineries in the State of Washington and 55.57% to British Columbia refineries. Last year, the split was 36.65% U. S. and 63.35% B. C.

Operating revenues of interstate natural-gas pipelines were $260,791,622 in August, up 17.4% over August 1959. For the 12 months ended August 31 they were $3,451,442,946, an increase of 17.5% over the preceding 12 months. Gas sales to other utilities for resale, almost 80% of total business, were up 8.9% in August, while sales to consumers were up 1.2%.

Russia has opened its first natural-gas pipeline in the northwestern Urals, a 44-mile link from Yarino field to Perm. Crews on the project have started laying a crude pipeline from Kamennolozhsky field to Perm refinery.

The newly laid gas pipeline on Alaska's Kenai Peninsula suffered a one-section blowout near Soldotna, at a point 12 miles east of the gas wells which will furnish gas for the Anchorage area. The 12-in. line was being tested when the section exploded. Gas ignited and burned about 30 minutes but no one was injured. The section was replaced and there will be no slowup in construction. Before winter set in, the Alaska Pipe Line Co. had laid 50 miles of the 82-mile line.

New Gas Strike Hailed in Sacramento Valley

THE Sacramento Valley last week came up with another promising gas discovery.

Occidental Petroleum Corp., Bakersfield, reports a wildcat it is drilling in Colusa County flowed at the rate of 11,500 M.c.f.d. during a 70-min. drill-stem test. The flow came from a 25-ft. interval at 7,652-77 ft. through a ½-in. choke.

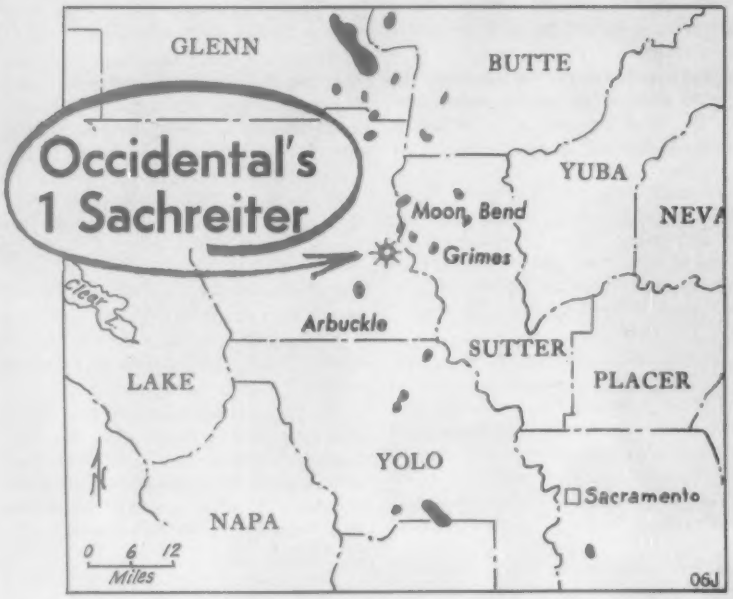
Occidental engineers calculated absolute open-flow potential at 100 million cubic feet a day, making it one of the best gas discoveries in California in recent months.

What is considered the best gas well found in California this year is the 1 Helen McLaughlin, which flowed an estimated 33,000 M.c.f.d. from six zones (OGJ, July 18, p. 72). The McLaughlin well is in Grimes field about 4½ miles east of the Occidental well. Cameron Oil Co., Los Angeles, and Franco Western Oil Co., Bakersfield, drilled the McLaughlin well.

The 1 Sachreiter, in Section 4-14n-1w, was drilled to a total depth of 8,263 ft. Final bottom-hole pressure was 5,075 psi. Occidental plans to complete the well in the 25-ft. interval at 7,652-77 ft. During a test of this interval gas surfaced within 2 minutes.

The wildcat could develop into a major new field discovery if the flow holds up to Occidental's expectations. The well is on a 4,800-acre block leased by Occidental. The company says there are 30 drilling locations in the block based on 160-acre spacing.

The new well is approximately 6 miles northeast of Arbuckle field, where Occidental recently completed nine wells without a dry hole.



Athabasca Oil Project Stalled

- New company's bid for Canadian Government's okay on recovery operation is laid aside—maybe for good.

THE CANADIAN Government has shelved until mid-1962 a bid to recover oil from the rich Athabasca tar sands. And the proposal may die on the vine.

Great Canadian Oil Sands, Ltd., a new group, had sought permission from the Alberta Oil and Gas Conservation Board to produce 11,500,000 bbl. of oil a year from the vast reserves locked in Athabasca's sands (OGJ, June 20, p. 2).

The board said it would not be in the best interests of Alberta to grant the application at this time. It also said consideration would be given to a request for a new hearing on the matter at any time between January 1, 1961, and June 30, 1962.

Great Canadian would be required to present new evidence on the feasibility of a recovery project. If no request for reconsideration is handed to the board before June 30, 1962, the application will be regarded as dismissed.

At the original hearing on Great Canadian's application, two other firms intervened. They were Can-Amera Oil Sands Development, Ltd., and a group headed by Cities Service Athabasca, Inc. (OGJ, Jan. 18, p. 44).

The Oil and Gas Conservation Board found that Great Canadian's proposed method of mining and separating oil would result in satisfactory conservation. But the board said it was unable to make "an absolute ruling" on the technical feasibility of the process, and expressed doubts that the project could be financed. The board also wants to be satisfied that a market for Athabasca's oil would be available.

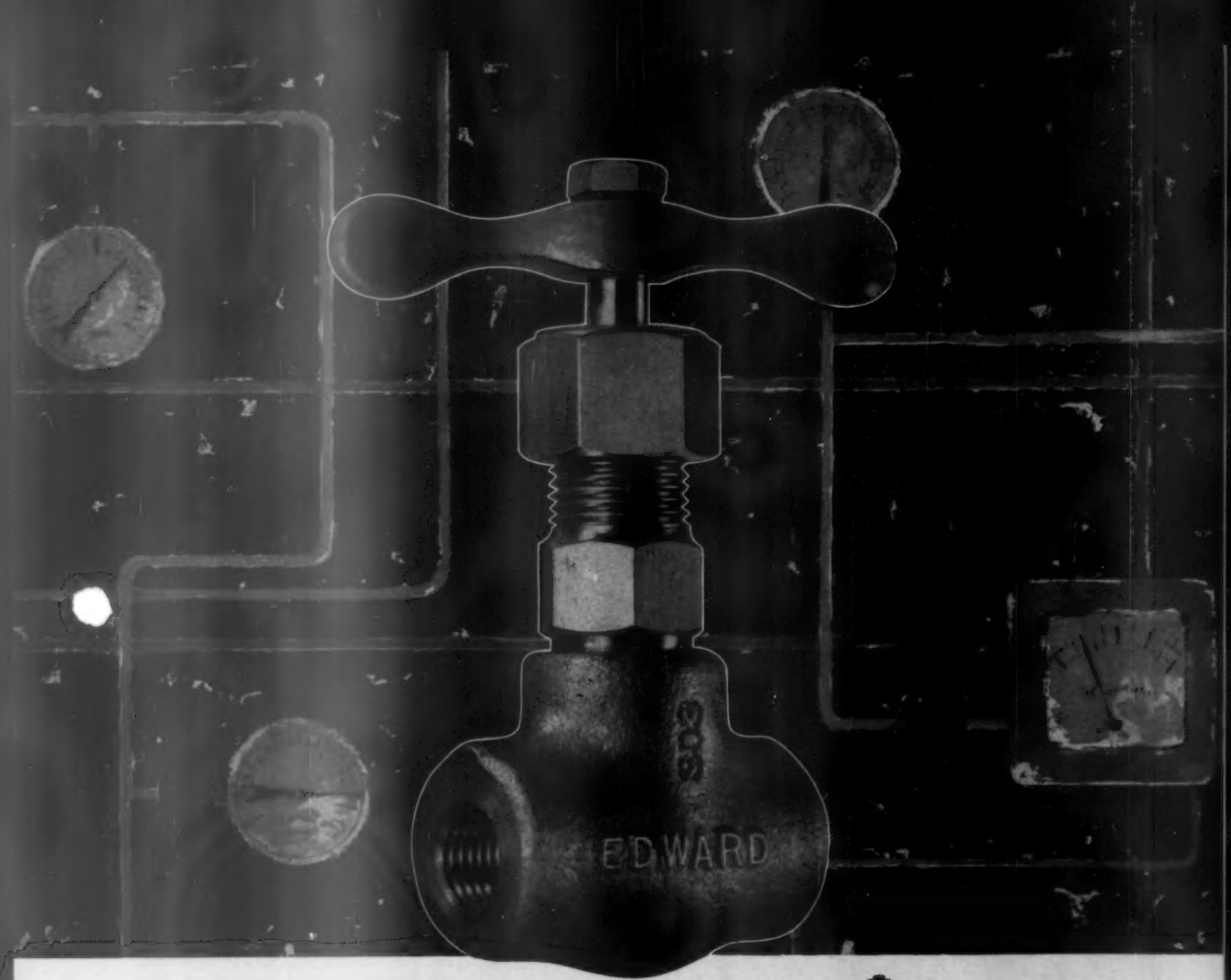
Great Canadian had planned to start selling oil to Sun Oil Co. and Canadian Oil Companies, Ltd. at Sarnia between 1963 and 1965. The board noted that this market could be supplied from conventional sources.

However, in its decision the board said it recognized the desirability of some commercial development of the Athabasca sands in the near future.

Located on the banks of the Athabasca River some 300 miles north of Edmonton, the oil sands cover 30,000 sq. miles. Estimates of the total reserves range as high as 300 billion barrels of oil.

Great Canadian's proposed method consists basically of mining the sand, extracting and partially refining the bitumen, and moving the crude to the Interprovincial Pipeline terminal in Edmonton. The over-all project would cost about $110 million.

Several experimental programs for recovery of Athabasca oil are in the mill. Cities Service Athabasca plans to keep on with tests for solvent extracting of the oil from the sands; Shell Oil Co. of Canada is interested in a program involving the injection of steam into test wells; and Pan American Petroleum Corp. has won a year's extension on its pilot program of testing a system based on underground combustion.



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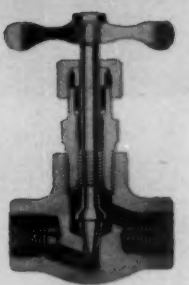
Instrument Valve
Fig. 952 & 2952
6000 lb WOG



Gage Valve
Fig. 152 & 4152
4000 lb WOG

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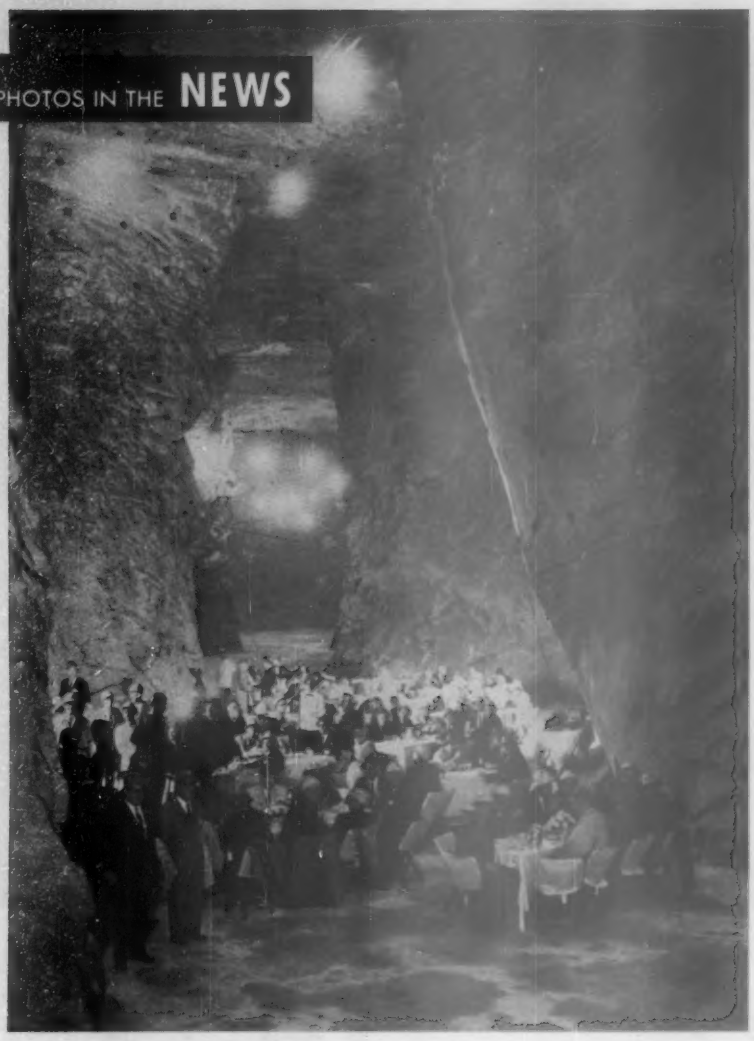
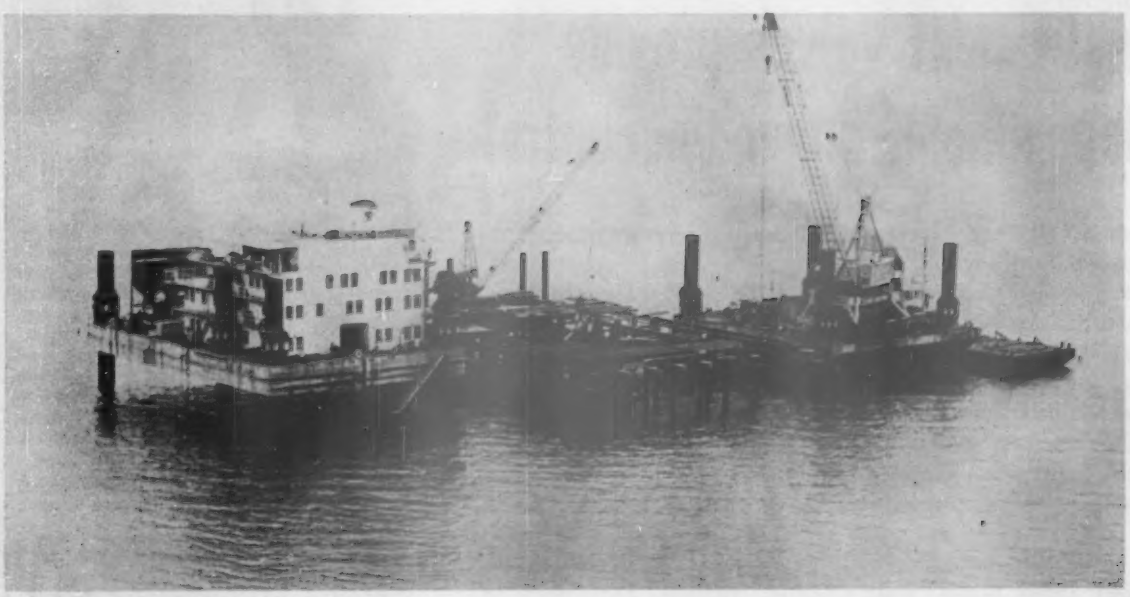


Lunch in the Mole Room

MORE THAN 250 persons attended an open house and luncheon 420 ft. underground in a storage cavern at the Sun Oil Co. refinery in Marcus Hook, Pa. The cavern, with a capacity of 400,000 bbl., is the largest granite cavern in the world. It's one of three granite caverns at Marcus Hook which will provide a total storage capacity of 900,000 bbl. (OGJ, Nov. 14, p. 112).

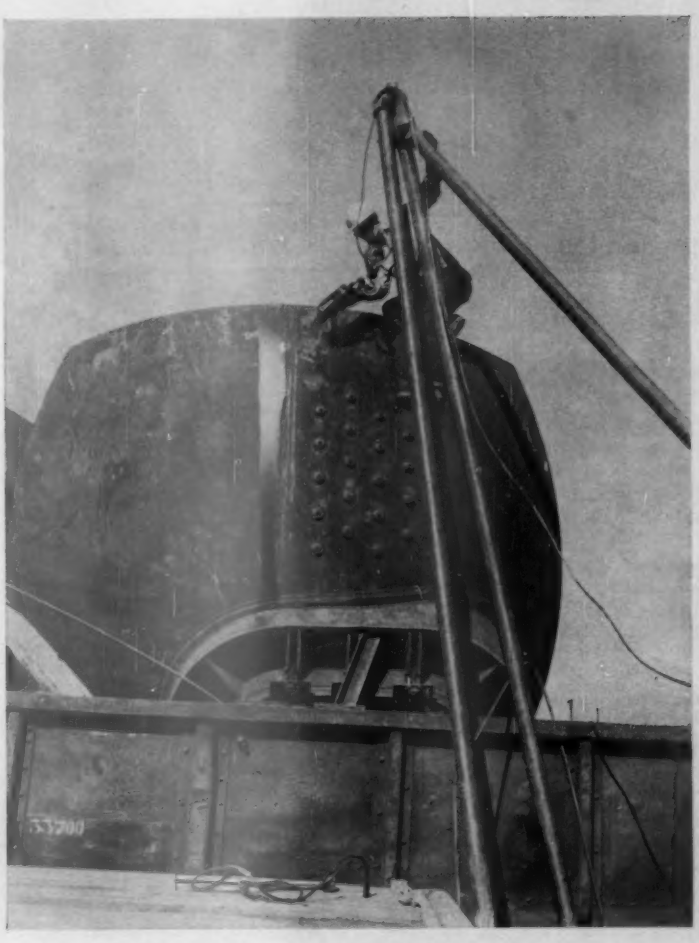
Fao Terminal

AN OFFSHORE loading terminal is taking shape at the head of the Persian Gulf, 24 miles from Fao. Its heart will be this 400-ft. by 240-ft. platform, the largest of five permanent platforms to be connected to form a 1,302-ft. terminal. The terminal will accommodate two 65,000-ton tankers. Crude from southern Iraq will be delivered by twin 32-in. submarine lines from Fao.



Nation's Biggest?

COVERING 94 ACRES on Neville Island along the Ohio River, Gulf's Pittsburgh Terminal is believed to be the nation's largest in potential throughput capacity. Tankage at right is for storing gasoline, fuel oil, jet fuel, aviation gasoline, and diesel fuel. Main office building and truck repair bays are at left. White lines indicate limits of terminal property.



Test Ball

THE BIG steel ball, being unloaded from a railroad car, will be a test-firing chamber for experiments with solid rocket fuels at the Esso Research Center, Linden, N. J. The research is being done for the Defense Department's Advanced Research Projects Agency. Pressure in the 18-ft. globe can be reduced to simulate high altitudes, and small amounts of potential solid propellants will be fired within the chamber by remote control.

India May Build Long Products Pipelines

- Four systems would be owned by the state and one would move both crude and products. If the lines are built, refineries would be constructed at two of the terminal points—Barauni and Bhusaval.

THE INDIAN Government is considering construction of a series of products pipelines that would interlace the country within 5 years.

The longest of the systems would be a 600-mile products line across northern India from Barauni to Delhi via Kanpur, Lucknow, and Allahabad. Products would be supplied by a 40,000-bbl. refinery to be built at the Barauni terminal of a 720-mile 14 and 16-in. pipeline system carrying crude from the Nahorkatiya area of Assam.

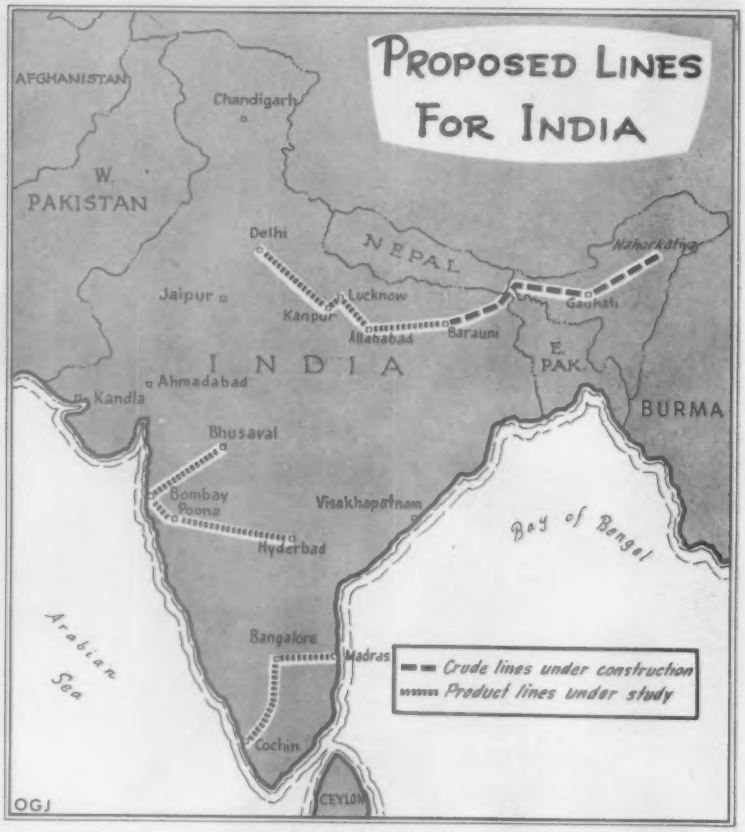
If the government decides to build the various lines, it expects to manufacture all pipe, ranging from 6-in. to 12-in., in India. Equipment imports will be limited to special pumps, electricity generating equipment, and similar type gear.

Another of the systems would be a 300-mile combination crude and products line from Bombay to Bhusaval. If this part of the project is approved, it will also be necessary to build a refinery at the Bhusaval terminal.

A line carrying both crude and products would be unusual, but not a complete innovation. At least three systems in the U. S. on infrequent occasions batch products with crude using a variety of ways to keep the crude from contaminating finished products. One way is to cut the complete interface back into the crude. Another is to run a buffer, such as naphtha, which can be cut either into crude or gasoline.

Another of the systems is a 120-mile products line from Bombay to Poona, to be extended later 300 miles to Hyderabad. The final proposal is for a 350-mile products line from Cochin, on the west coast, to Madras and Bangalore.

A recommendation has been made to start work on three of the systems immediately, with completion scheduled in 5 years. The fourth system would be started in 1963. The government did not disclose which of the three systems would be built first if the project goes through.



Government marketing . . . While the pipelines would be state-owned, it was not disclosed whether the state would reserve them for its own use or, in some cases, make them common carriers available to private marketers.

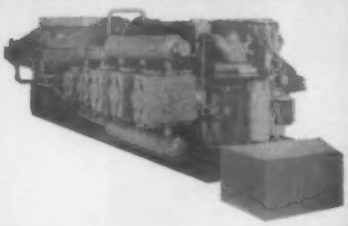
The government's new marketing organization, India Oil Co., plans to build product terminals at Bombay, Ahmedabad, Visakhapatnam, Kandla, Jaipur, Chandigarh, and Delhi. These will handle both Russian imports and products from Gauhati and Barauni refineries.

Nahorkatiya supplies grow . . . A 260-mile 16-in. pipeline outlet from the Nahorkatiya producing area in Assam is now under construction to a refinery being built at Gauhati. This will be extended as a 460-mile 14-in. line to the second refinery at Barauni.

Production estimates of the area have risen steadily since the initial discovery 7 years ago, and recent drilling by Oil India Private, Ltd., has enabled it to boost reserves still another notch. If the success continues, Oil India Private, owned two-thirds by Burmah Oil Co. and one-third by the government, will have a capacity of at least 61,000 bbl. daily for 15 years.

The company places proven recoverable reserves at 30 million tons, or about 223 million barrels, based on a conversion of 33°-gravity crude. In addition, there is another 13 million tons, or 96 million barrels of indicated recoverable reserves.

Oil India, the successor to Assam Oil as the operating company, has now completed 85 deep wells in the Nahorkatiya, Moran, and Hugrijan licenses in the Brahmaputra Valley. Fifty-eight of the tests have been completed as oil producers.



Design engineered for gas booster service in the Louisiana Gulf Coast area, this packaged GMXF-10 compressor moves 4.43 MMSCFD. It is rated at 825 bhp. Equipped with Entronic Controls for remote field operation, this unit is a typical example of the efficiency gained by specifying C-B/Southern Packaged Compressor Plants.

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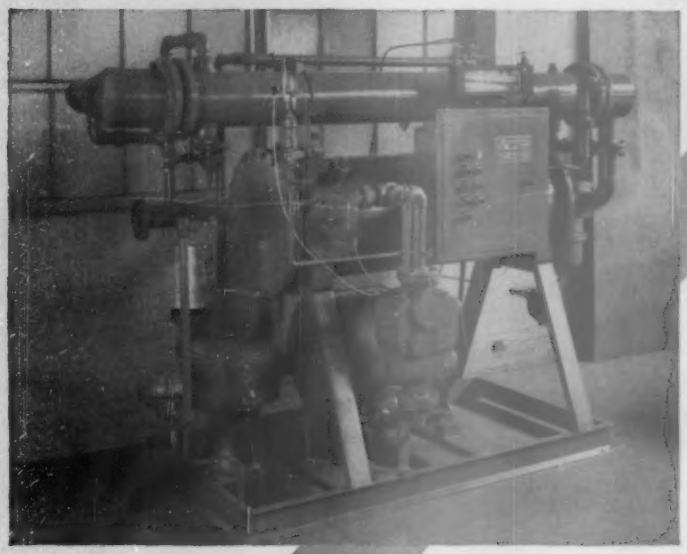

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Algerian Production to Rise

. . . next year with completion of a line linking El Gassi to the Hassi Messaoud-Mediterranean crude line.

A NEW oil field in the French Sahara will go into commercial production next year with the completion of a planned 75-mile, 10-in. tie into the existing pipeline system from Hassi Messaoud to the Mediterranean Coast.

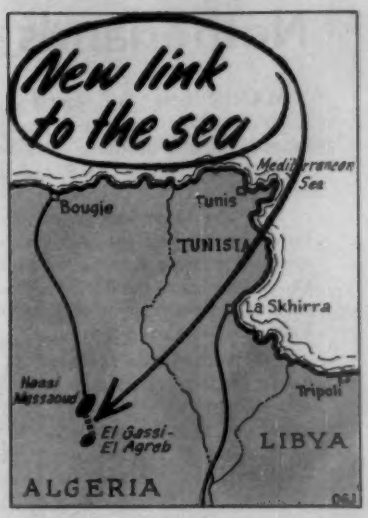
The new field is El Gassi-El Agreb, found by SNPA last year 50 miles south of Hassi Messaoud. Four wells already completed will sustain an initial production of 10,000 bbl. daily. They are El Gassi 1, El Agreb 2, El Agreb 6 and El Agreb 7.

El Gassi-El Agreb came by its double name because it lies on two licenses, El Gassi and El Agreb. Both are held by Soc. Nationale des Petroles D'Aquitaine (SNPA), which is developing the field in partnership with Coparex, Eurafrep, and Francarep. SNPA is the operator.

El Gassi 1 made the initial discovery in the 11,600 ft. range. El Gassi 2 was a dry hole. But El Agreb 1, 9 miles southwest of El Gassi 1 came in as a producer. The formation is continuous all the way down, and the company believes both wells produce from the same sandstone formation.

The El Gassi find is in the extreme northwest corner of the El Gassi license. The structure extends to the south and west onto the El Agreb license, and northward onto the Oued Mya license, operated by SN REPAL.

Production from the new field will be added to the existing forecasts for Saharan crude next year. These anticipate an output of 170,000 to 180,000 bbl. daily from Hassi Messaoud, and a similar amount from CREPS' fields in the Edjele area.



Aramco Developing Old Field

• New Hadriya well completed. Field development was postponed 20 years while shallower pays were worked.

ARAMCO has completed a third producing well in a program to take one of its oldest oil fields, Abu Hadriya, out of moth balls.

The well, Abu Hadriya 6, is 87 miles north-northwest of Dhahran in the second and deepest field ever discovered in Saudi Arabia. It is in the same depth range as the discovery, which was taken to 10,220 ft. Production is from the same formation, the Hadriya.

The initial find was made in 1940, but was never fully explored because of prolific discoveries made later at shallower depths. Ghawar, found 12 years ago, produces more than 700,000 bbl. daily from the 7,125-ft. range. Abqaiq produces from 6,800 ft. and Safaniya from 5,560 ft.

Drilling on the structure was suspended for several years after the first four wells were completed. In addition to the discovery, there were two dry holes, and a well completed as an observation well.

A rig was moved back on the structure last year and No. 5 was completed as a producer in the Arab Zone, the most prolific in the country. No. 6 was then drilled 3½ miles west of the discovery and completed in the Hadriya formation. This is lower than the Arab Zone, but is still Upper Jurassic. Aramco has never disclosed the result of production tests on any of the wells.

Abu Hadriya 7 was started November 1 at a location 6½ miles southeast of the discovery.

Israel Gets Gas Stepout

A STEPOUT to Israel's Kidod gas discovery gives further hope for substantial gas supplies west of the Dead Sea.

Kidod 2, a mile northeast of the discovery, came in as a gasser at 3,950 ft. It is drilling ahead to a projected 5,900 ft. to test possible oil pays. The discovery is 2 miles north of a small commercial gas field, Zohar, which Naphtha Israel plans to develop fully before turning to the new find.

Naphtha Israel holds the Kidod concession and is operator in a joint test with Israel Negev Petroleum.

A gathering system now is being laid to completed wells at Zohar, and the seventh test is in progress. Pipe deliveries have started for an 18-mile 6-in. line to a potash works on the Dead Sea. The system will be built by Messrs. Sol el Boneh, Ltd., of Haifa. The contract calls for completion of the system within 100 days of the award.

A 75-mile 16-in. line to a power plant at Ashdod Yam on the Mediterranean Coast is planned.

Russian Rigs to Drill for Castro Oil

TWO heavy Russian rigs reportedly are on their way to Cuba to assist a drilling program planned by Premier Fidel Castro's government.

Russian newspapers quote Cuban oil officials as saying 14 rigs will be in operation in Cuba by the end of 1961, including Russian gear. Alfonso Gutierrez, director of the Cuban Petroleum Institute, predicted in Moscow the discovery of "profitable oil deposits" within the next few years.

The Cubans said that six rigs were in operation in Cuba during October. Reports from Cuba indicate that if this many rigs actually are in operation, at least five are probably cable-tool outfits. Crude production on the island is presently down to about 300 bbl. daily.

Drilling in Cuba hit its peak early in 1956 when twelve rotaries were in operation. Activity gradually slowed almost to a standstill by the time Castro came into power.

Netherlands Confirms Large Gas Reserves

MAJOR new gas reserves of at least 2 trillion cubic feet have been tapped in the northern Netherlands by Royal Dutch - Shell and Jersey Standard.

The find ranks as one of the most important oil and gas discoveries ever made in western Europe, and appears to be the most important gas find since the discovery of a deep pay at Lacq, in southern France.

The Netherlands Ministry of Economic Affairs confirmed reserves of about 2 trillion cubic feet. It did so in an unusual manner when it commented on a statement by Belgian Senator Victor Leemans that reserves of about 300 billion cubic meters, or more than 10 trillion cubic feet of gas had been found in the northern Netherlands.

The ministry confirmed that new quantities of natural gas had been found, and added: "It would be safe to assume amounts to about one-fifth of those added by Leemans." This puts the reserves in the 2 trillion cubic feet range.

Two separate finds have been made by the joint Shell-Jersey operating company, N.V. Nederlandse Aardolie Mij (NAM). One of the finds is Delfzjil 1, across the Ems River from Emden, West Germany. The second is at Slochteren, where two successful wildcats have been drilled between

Groningen and the mouth of the Ems River.

The Slochteren gas is apparently obtained from excellent reservoir rock in a carboniferous formation called the Lower New Red. The field is on a separate structure from the Delfzjil find, 25 to 30 miles to the east, and the pay is deeper. NAM has disclosed no data on individual wells.

NAM plans to drill more wells in the area west of Groningen near the village of Grootegast, and further south near Diever in Drenthe Province.

The only other find in the northern Netherlands is a small gas field found in 1956 at Ten Boer.

All natural gas produced in the Netherlands by NAM, the only operator, is purchased at the wellhead by the government. The gas is delivered through state-owned pipelines and resold to municipalities which use it to enrich town gas. Deliveries to the government last year averaged 18 million cubic feet daily, out of 40 million cubic feet available.

The new reserves, however, promise a major new energy source both for the Netherlands and possibly for export to neighboring countries. Reserves of 2 trillion cubic feet could supply 275 million cubic feet of gas daily for 20 years.

Venezuela Discount Ban Near

COMPANIES operating in Venezuela have until December 31 to revise crude-sales contracts to bring them within the maximum 5% discount off posted prices.

Dr. Juan Pablo Perez Alfonzo, Minister of Mines and Hydrocarbons, said that some contracts have already been revised to bring them in line with the 5% discount limit ordered last month.

He said that only a small volume of sales is involved.

FOREIGN BRIEFS . . .

The Egyptian Government's General Petroleum Co. reports a flow of 126 bbl. daily from a discovery well at Rahmi, 30 miles north of the state-owned Ras Bakr and Kreim oil fields that went into production earlier this year. The discovery well is flowing from a 69-ft. pay topped at 1,376 m. or about 4,500 ft. This structure is believed bigger than either Ras Bakr or Kreim areas from which General Petroleum is producing several thousand barrels daily.

Mobil International production tests on a stepout to a discovery in Turkey yielded 977 bbl. daily through a ⅜-in. choke and 1,600 bbl. daily through a ½-in. choke. Tests were made after acidization on Bulgurdag 2 in South Central Turkey. Oil is 38° gravity without water cut, and final depth of the well is 5,829 ft. Mobil confirmed the well as a better producer than the discovery, which is less than ½ mile north of Bulgurdag 2. The discovery flowed 1,200 bbl. daily from about 4,700 ft. after acidizing.

The first petroleum refinery in Central America, a 4,000-bbl.-daily processing plant at a jungle site near Puerto Barrios, Guatemala, will go on stream early next year. Mostly prefabricated in Texas, the plant materials were shipped by boat. The Lummus Co. designed and built the plant for Breaux Bridge Oil Refining Co., Inc., of Houston. Included in the refinery are a crude-topping unit, a desulfurizer, and a catalytic reformer.

The Japanese-owned Arabian Oil Co. has tested its fifth well in its Neutral Zone offshore tract at 8,400 bbl. daily from 5,420 ft. The first four wells were completed as producers in the 6,000-bbl.-daily class. The company plans to complete three more wells by the end of the year, and start moving commercial production to Japan in the spring.

Notice of withdrawal from an oil exploration venture in southwestern Queensland and northwestern South Australia has been given by Frome-Broken Hill Co. Pty. Ltd. Other partners in the continuing exploration are Santos Ltd. and Delhi Australian Petroleum Ltd.

Tradewinds Exploration has spudded its third wildcat on the Island of Timor northwest of Australia. Tradewinds owns 40% of a 7,000-sq.-mile concession on the island along with Timor Oil, Ltd., an Australian company. The two previous wildcats were dry holes.

A West Pakistan drilling program has been scheduled for early next year by Tidewater Oil Co. on a 3,850,000-acre concession. Several large structures in the area have been mapped during geological and geophysical work.

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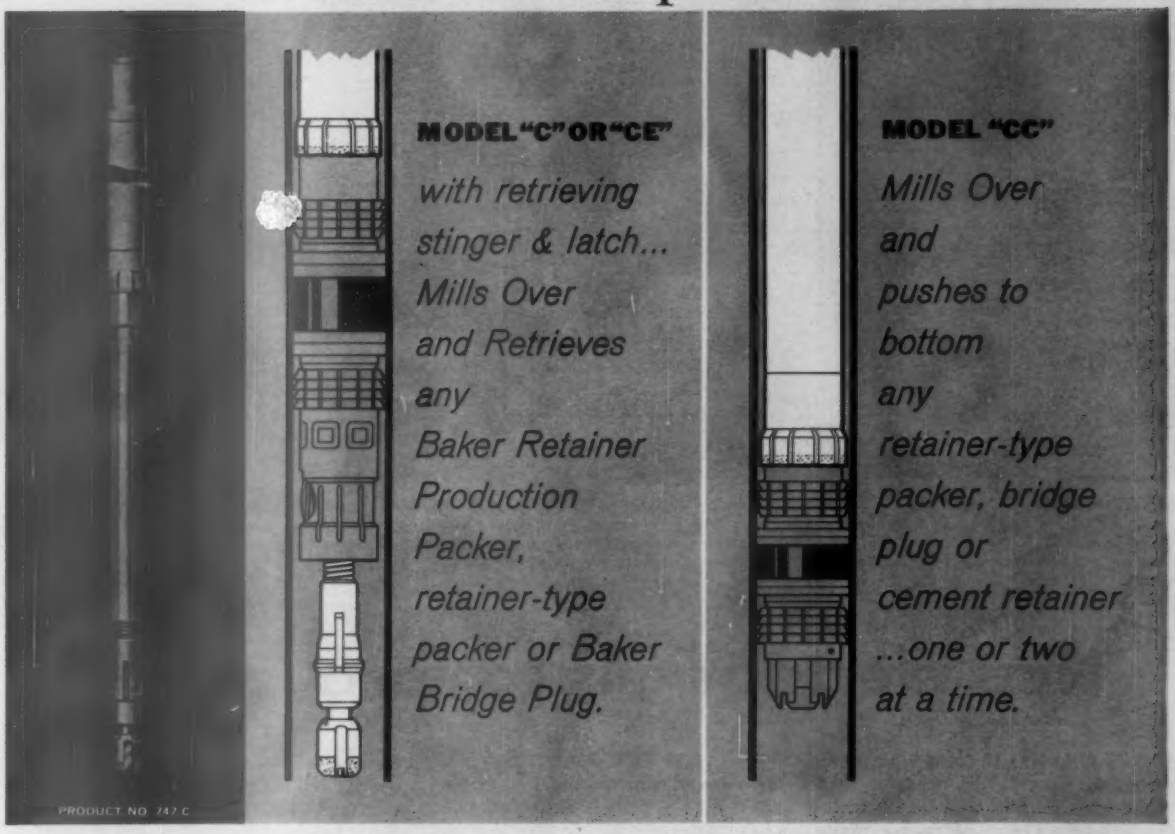
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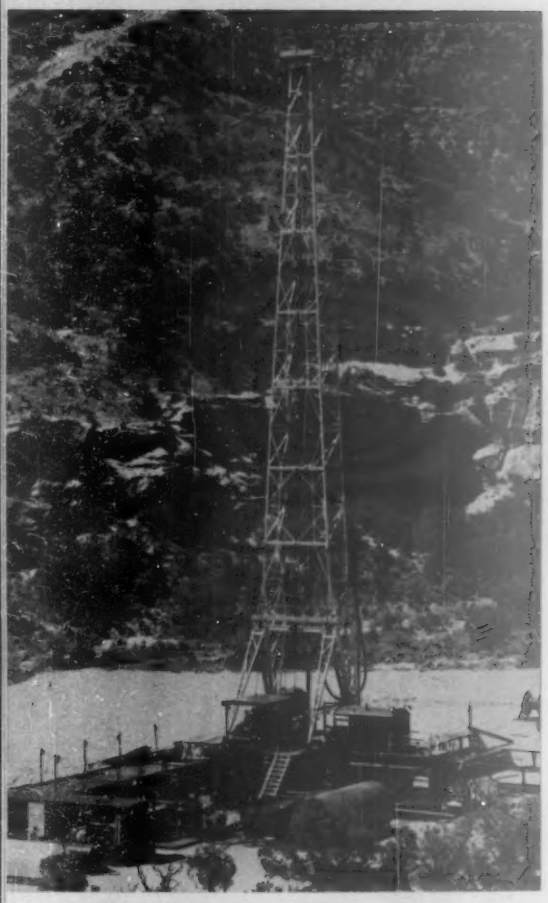
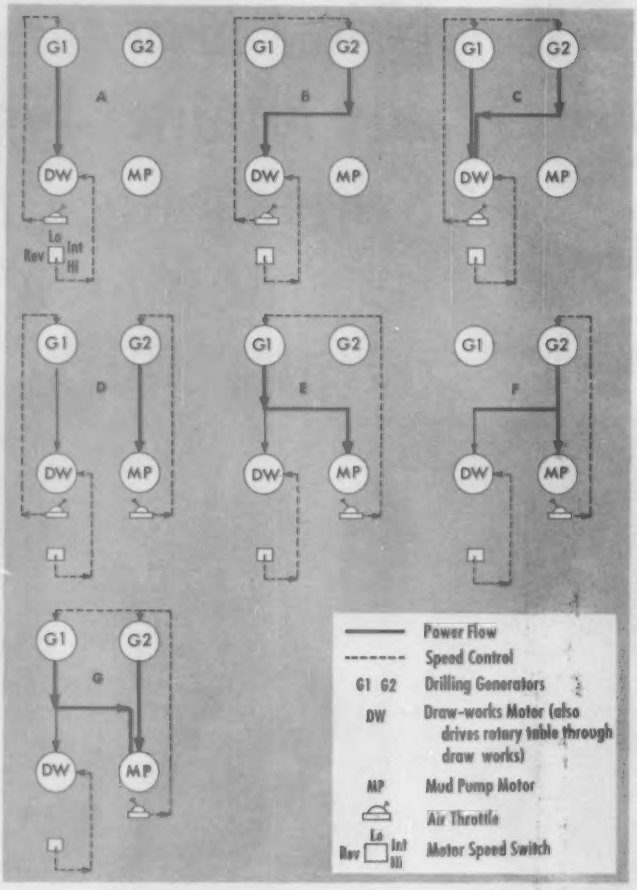


NEWLY CONVERTED ELECTRIC rig, Exeter Drilling Co.'s Rig 3, drilling near Farmington, N. M., for Delhi-Taylor Oil Corp. Major equipment moves in five loads, can be drilling in 12 hours after move starts.



FLEXIBILITY OF POWER FLOW is shown in these seven diagrams of the ways in which generator power may be put on load motors. Notice that power from either generator may be split to run two motors simultaneously.

New electric rig is compact, portable,

BY F. R. MAYER
President Exeter Drilling Co., Dallas

EXETER DRILLING CO. has converted its Rig 3 into what it feels is the most modern and flexible drilling rig in the Four Corners region.

Now operating as a diesel-electric unit, the converted rig has improved over-all operating efficiency through:

1. Greater portability.
2. Faster rigup and teardown.
3. Increased drilling rate.
4. Lower maintenance cost.

At the same time, the rig still retains the flexibility of the split rig.

Portability of this 900-hp., medium-depth jet-bit drilling rig was improved by compacting the equipment into a minimum number of easily handled units. Each unit is the proper size and weight for a truck load. On normal moves, there are these major packages:

Draw works, 1 package
Mud pump, 1 package
Power plant, 1 package
Mast substructure, 1 package (formerly 2 packages)

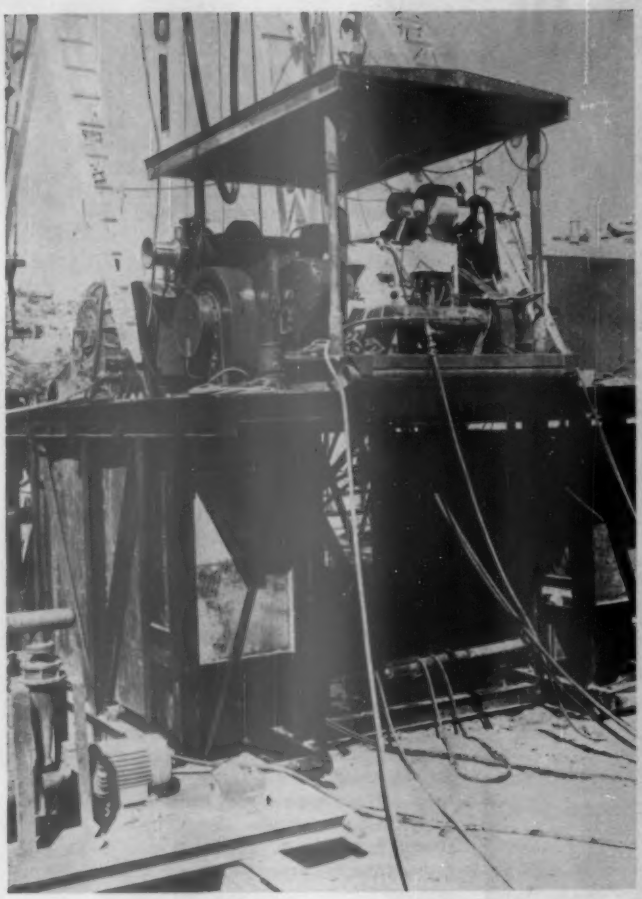
Formerly, the rig required seven units for the equivalent equipment. Moreover, weight of the rig has been reduced by 75,000 lb. On any normal move, this 6,000 to 8,500-ft. rig can move, rig up, and spud in 12 hours. Rigup and teardown are faster and simpler because no unit, except mast and substructure, require assembly or alignment.

The draw-works package is the sole unit needed on the substructure. The power package can be spotted anywhere on the location Locations may be smaller since less truck room is needed for rigup and teardown. Only electrical cable with quick makeup, plug-in connectors, and piping are required between the units once they are set in position.

Penetration rates will be higher as a result of improved hydraulics. The D-550 Continental-Emsco power slush pump has a favorable weight-to-horsepower ratio for a highly portable rig. It is now powered by a d.c. electric motor for a flexibility that will enable the operator to fit his hydraulic program to the formation being cut. High hydraulic horsepower is available for jet-bit drilling.

Over-all, the rig has ample horsepower for all operations and a high degree of versatility in the nine forward rotary and draw-works speeds.

These factors, when combined with



COMPACTNESS OF DRIVE shows in this rear view of the National 50A draw works driven by GE 752U1 d.c. motor. Double shaft-extension from 1,000-hp. motor drives air compressor from back end through belts. Desander at lower left is driven by 30-hp. a.c. totally enclosed motor.

DRILLER'S CONSOLE is compact unit with meters to indicate speed and torque of both draw works and pump motors. Switches assign power from the generators and select speed of the draw-works motors. Driller Clair P. Wilson operates brake on one of the early holes drilled by Rig 3.

flexible—for Rocky Mountain drilling

the low maintenance of electrical equipment and the comparable cost of this setup compared to conventional equipment, indicate that Exeter's Rig 3 is a prime example of the rig of the future for the Rockies.

One of five. Rig 3 is one of five that Exeter operates in the Rocky Mountain region and is under direction of Tool Pusher Lee Naylor. Conversion was designed by Continental-Emsco and uses two Caterpillar D-353TA engines and a GE V-222 electric-drive system.

At the present time, the diesel-electric unit is drilling its third hole, the 1-26 Federal in the NE SW SW 26-30n-13w, San Juan County, New Mexico, for Compass Exploration, an independent operator that has been quite active and successful in locating reserves in the Four Corners area. The debut of the converted rig was on Delhi-Taylor Oil Corp.'s 1 Michener, NE SW SW 15-28n-9w, San Juan County, New Mexico, J. B. Howell, superintendent. The second well, also for Delhi, was the 1-B Delhi-Florance, in NW SE SW 9-28n-8w, San Juan County, New Mexico.

Whereas this is the first unit of its type to be used for medium-depth drilling in the Four Corners area and while Exeter's expectations were rigid, the rig has measured up in every respect.

The equipment. The rig is composed of a National 50-A draw works, chain-driven by a GE 752 U1 drilling motor. Total weight of the draw-works package is 40,000 lb.

A 17½-in. Continental-Emsco rotary table is chain driven from the draw works.

Another GE 752 U1 drilling motor drives the Emsco D-550 mud pump and the two are unitized on one skid, 21 by 6 ft., weighing 40,000 lb.

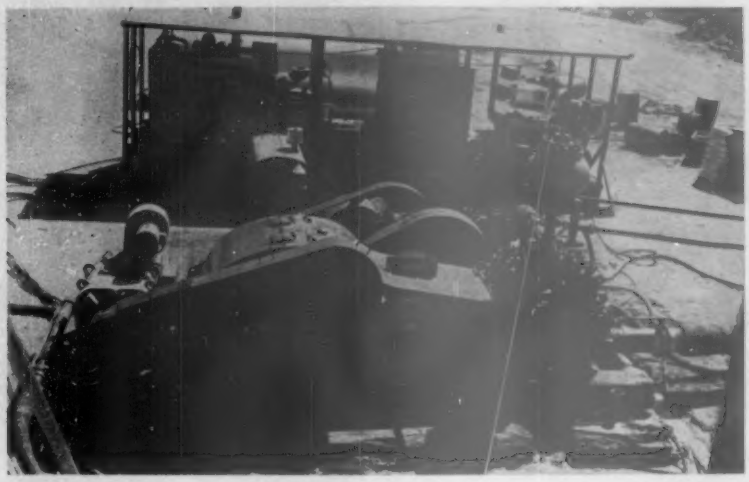
The mast is a 127-ft. Lee C. Moore with a substructure 33 ft. long, 18 ft. wide, and 11 ft. high.

All power for the rig is mounted on one 8 by 29-ft. skid weighing about 40,000 lb. Main engines are rated 425 hp. each at 1,400 r.p.m. These engines are turbocharged and aftercooled, equipped with blower fans with one engine having a gasoline starter, the other an air starter.

Each engine drives a GE GT-602A1 DC drilling generator. These generators are rated 450 hp. at 1,400 r.p.m.

The light plant, also mounted on the power skid, has a D333A diesel

MAIN POWER SKID is only 8 by 29 ft. and weighs 40,000 lb. It carries both engines and main generators. In addition, there is an auxiliary engine driving a light plant; a standby light plant is belt-driven off one of the main generators. Here Motorman William J. Mayberry inspects a.c. auxiliary motor-controls and d.c. control switches.



RATED AT 700-HP. Input for pumping service is d.c. motor connected to Emsco D-550 main slush pump. A separate diesel engine drives mud-mix pump behind main pump. One generator can power the main pump and the rotary table simultaneously.

engine with gasoline starter driving a 50-kw, 1,800 r.p.m. GE brushless a.c. generator and a 25-kw. d.c. exciter. A standby duplicate a.c. generator and d.c. exciter are belted from the tail shaft of the No 2 main drilling generator.

Additionally, a KG-191 main electric control compartment containing all d.c. and a.c. controls for the rig, and a 3YC a.c. motor-driven air compressor and air tank are included on the power skid.

All equipment mounted on the power skid is permanently wired. During a move it is only necessary to unplug three cables each to the draw works and the pump motors, two cables to the driller's console, two air throttle lines, and cables to small auxiliary a.c. motors and lights.

Auxiliaries consist of a 30-hp. a.c. desander motor, a 10-hp. water-pump a 3-hp. shale-shaker motor, the lighting-distribution panel plus the 3-hp. air-compressor motor on the power skid. Alternating-current generators are connected to supply 120/208Y volts, the three-phase 208-volt power going to motors and 120 volts for lights.

Flexible power. The system is arranged so that the driller may assign either generator to either motor or to both motors simply by turning the two generator-assignment switches on his console. A diagram shows typical available-power assignments along with corresponding speed console.

The first three diagrams are possible hoisting assignments. The air throttle controls output of the assigned generator or of both generators in parallel. Motor speed can be controlled from creeping to top speed. Top motor speed at full throttle can further be preset by the draw-works motor speed switch on the driller's console. This amounts to an electrical gearshift in the motor with one reverse and three forward speeds, the HIGH setting being approximately 50% faster than LOW in this application.

Diagrams D, E, F, and G, are assignments used while drilling. In D, one generator is assigned to each motor; result is independent, stepless throttle control of pump and rotary speed. Here again the driller can preselect maximum rotary speed with the motor speed switch.

Diagrams E and F show how either engine can be used to power the pump and rotary. In this case, the pump throttle which governs generator output affects the speed of both motors. This throttle is set to give desired pump operation. Then rotary speed can be independently adjusted by shifting draw-works transmission ratios and setting the rotary (draw works) motor speed switch.

The 50A draw works has three transmission ratios which change rotary speed, and for each mechanical ratio three electrical speed ranges are available. This gives the driller a choice of nine rotary speeds spread over the normal rotary operating range for any given pump-speed setting.

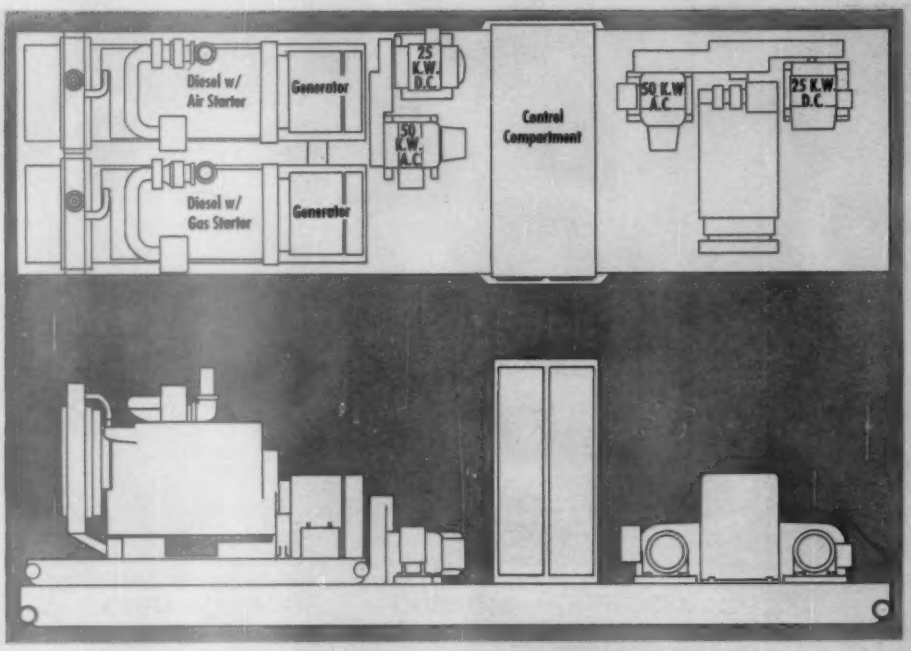
Often, too little power is available from one engine-generator set to meet for pump requirements. Then, the assignment illustrated in diagram G is used. This compounds both generators on both motors. The pump and rotary motors now absorb power in proportion to their respective loads; most of the power of the two engines is delivered to the pump. A relatively small amount goes to the rotary.

Here again, pump-throttle setting is the prime control of speed. Still, there is a choice of nine speed steps available for the rotary as explained above.

Constant, Variable Engine Speed

The control system gives a choice of operating the main drilling engines either at a constant speed or at variable speed. The engines have air-actuated governors and there is an engine-speed control switch in the electric controls. When this switch is set on constant speed, full air pressure is put on the governor actuators; this keeps the engines at top governed speed of about 1,400 r.p.m. The driller's throttles are then connected only to actuators which control generator excitation. Thus, the driller controls generator output voltage and electric-motor speeds without changing engine speed.

When the engine speed switch is turned to variable speed, the driller's air throttles are connected directly to the engine-governor actuators and also to the generator-control actuators. Now, suppose the driller advances his throttle. In doing so he changes the engine governor setting to accelerate



POWER SKID DIAGRAM shows compactness of engine, generator, control and light-plant equipment. All wiring between control panel, drilling generators, light plants, exciters, and air compressor is permanently connected in the skid.

the engines from low idle (about 650 r.p.m. with throttle off) to full speed in proportion to throttle position. Simultaneously he increases generator excitation. The combustion of excitation and speed change on the generator changes its voltage output to control electric motor speed.

The electric motor performs the same under both methods of engine operation. But, variable-speed operation permits the engines to idle at low speed when throttles are off. Or, when less than full power is needed, the engines can run at intermediate speed with throttles partially advanced.

When engines accelerate in response to throttle pressure in variable-speed operation, there is a time lag built into the system. The lag is such that acceleration actually occurs at light load; the electric transmission has torque-conversion characteristics which supply torque to accelerate the load without tending to lug the engines.

In other words the engine is allowed to accelerate first. Then, the load follows. This is like jerking on the end of a rubber band tied to a weight. Your hand can accelerate before the weight does.

With this engine-speed control system, main engines operate at variable speed during light or partial-load periods. This saves fuel, but requires that auxiliary power be taken from the separate light-plant engine.

If the small light plant should be down for any reason, the main engines are switched to constant speed. Auxiliary loads are switched to the a.c. generator and d.c. exciter driven by the No. 2 main engine during this time.

Constant-speed operation is normally used while making a trip even though auxiliary loads are carried by the light-plant engine. This avoids the repetitive acceleration and deceleration of the main engines.

Safety Features

A number of safety features are incorporated in the system.

Combustible gas. If there should be gas around the hole, the draw-works motor can be ventilated from a remote point through a duct. Moreover, the driller's console is slightly pressurized by an air-hose connection. Thus, leakage is always outward.

Ground relay. To prevent arcing, main power circuits are grounded through a relay which removes all power in event of an electrical fault to ground.

This relay signals the driller by lighting a light on the console. If the fault was momentary, the relay can be reset and operation resumed.

If the fault is maintained, the faulted portion can be isolated and operation resumed with the remainder. Or, in emergency, the ground relay can be removed from the circuit and operation resumed until the hole is safe to shut down for repairs.

Emergency console cutout. Since the driller's console is located on the rig floor, an emergency switch is provided in the control compartment on the engine skid. This switch makes essential power-assignment functions in event of damage to the console or its two connecting cables.

Or, suppose the driller's controls fail to operate due to damage or malfunction. It is necessary merely to unplug its two connecting cables at the power skid. Then, the emergency switch is used to assign power to continue operation until the console is repaired.

Motor, generator cutouts. There are cutout switches on each motor and generator. These can isolate that particular machine from the rest of the system. Thus, the driller cannot start a motor while its connected machine is being worked on. Or he cannot load a generator while an engine is being adjusted.

Engine safety switch. The circuitry for each generator is interlocked through a switch on its engine. This switch isolates the generator if oil pressure is too low or water temperature too high.

Indicating meters. In addition to the two generator-assignment switches and the draw-works-motor speed-selector switch discussed above, the driller's console contains a voltmeter and ammeter for each motor. The voltmeter reading is proportional to motor speed; it can be interpreted in terms of pump strokes, line speed, or rotary r.p.m.

The ammeter reading is proportional to motor torque; this indicates pump pressure, line pull, or rotary torque.

For either motor the product of volts and amps is watts which divided by 746 gives horsepower. Thus, the meter readings can be used to monitor the drilling operation. Any abnormal condition can be detected at a glance.

Blower lights. The driller is warned of loss of ventilation on the electric motors by lights on the console. A horn blows if power is applied without ventilation.

Emergency stop. A push button on the console can be used to remove all power in emergency. All throttles must be returned to off position to restart.

CLEAN LAYOUT is one of the outstanding features this huge, new gas-processing plant.

Lean pipeline gas is squeezed dry

. . . by huge extraction plant

BY J. A. SUTHERLAND
Union-Texas Natural Gas Corp.

W. M. HATHAWAY
Fluor Corp.

P. W. EATMAN
Fluor Corp.

ANOTHER giant gas-processing plant, operated by Union-Texas Natural Gas Corp., has gone on stream in Acadia Parish, Louisiana, near Rayne. Design and construction of the facilities were handled by Fluor Corp., Ltd.

The plant is adjoining property of Columbia Gulf Gas Transmission Co. Rich gas is piped from Columbia Gulf's dehydration facilities to the absorber system and lean gas is returned to the suction of Columbia Gulf's compressor station.

- This 650-M.M.c.f.d. plant recovers 90%+ of the propane in the inlet gas, generates its own power, and has complete fractionation facilities for handling 316,000 gal. of product per day.
- Centrifugal propane refrigeration compressors maintain the absorption section at −40° F.
- Total fuel consumption is less than 1% of the inlet-gas volume.
- Gas-pressure loss through the plant is around 10 psi.
- Equipment is designed to allow plant expansion for future ethane recovery.

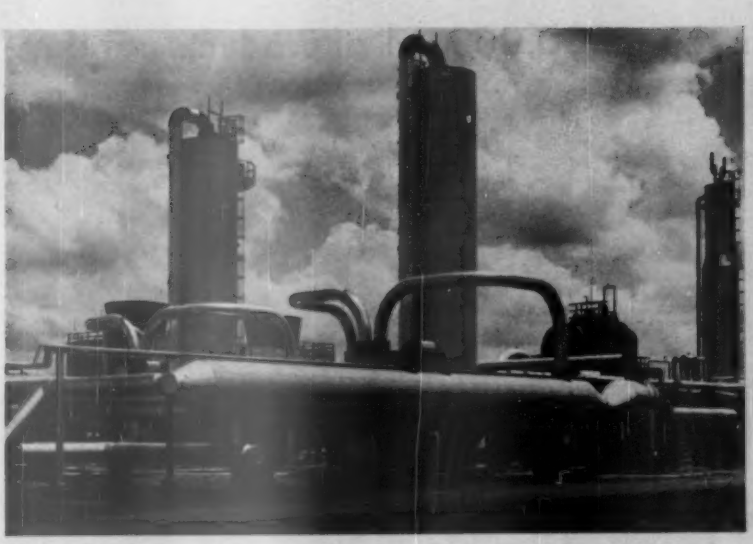
General process scheme. Two absorbers, operating at 600 psi., are connected in parallel. These vessels are designed to handle a total of 750 M.M.c.f.d. of inlet gas.

Light absorption oil in the heptane range (100 mole wt.) is cooled to −40° F., using propane refrigerant. Rich gas is also chilled to −40° F., in the inlet gas exchangers and chillers, and contacted with the presaturated cold lean oil in the absorbers.

Rich oil from the absorbers is flashed at 535 and 325 psig. The high-pressure flash gas goes to fuel. Gas from the second-stage flash goes to the top section of the rich-oil deethanizer, and the liquid is fed into the bottom section. Deethanized rich oil is stripped in a dehexanizer, where gasoline and lighter components are taken overhead to a raw-product storage tank.

Lean oil from the bottom of the dehexanizer is passed through heat exchangers and chillers. Final lean-oil cooling is accomplished in the presence of deethanizer-overhead gas, which presaturates the oil before it is pumped back to the absorbers. Vent gas from the presaturator is exchanged to recover refrigeration, and can be used as fuel. Excess is recompressed, along with the high-pressure flash-tank gas, and put into the sales-gas line.

A rerun still is available for cutting out traces of heavy ends which slowly build up in the lean oil.



GAS EXCHANGER, in center foreground, and propane chiller, attached to far end of exchanger, cool the incoming gas to —40° F.

Products. Extraction and fractionation equipment is designed to recover 90% of the propane in the inlet gas, plus essentially all of the heavier components. Provisions have been made for future expansion to recover 35% of the ethane in the inlet gas.

Present total production, based on 650-M.M.c.f.d. throughput, is approximately 300,000 gal. of products per day, over 50% of this being propane. The fractionation system produces 95%-purity propane, 97% isobutane, 97% normal butane, and either debutanized, intermediate, or 30-psi. R.v.p. natural gasoline. Propane and butanes will meet NGAA specifications.

Refrigeration is provided by two 5,000-hp. steam-turbine centrifugal propane compressors operating in parallel at 5,850 r.p.m. Each of these machines handles half of the propane compression requirements. Two economizers are used to flash condensed propane down to a low temperature level before feeding it to the chillers which operate at −50° F.

Steam system. In normal operation, three 70,000-lb. per hour forced-draft boilers operate at part load to furnish approximately 180,000 lb. per hour of 600-psi., 750° F. superheated steam. This steam is used in driving generators, refrigeration compressors, cooling-water pumps, lean-oil pumps, one boiler feed pump, and one boiler fan.

Generator turbines exhaust to a 250-psi. system, which furnishes heat for reboilers in the extraction plant. The refrigeration turbines exhaust to a surface condenser at 26-in. Hg vacuum. Other turbines exhaust into a 60-psi. system which furnishes heating steam for the depropanizer, debutanizer, and deisobutanizer reboilers.

The main boiler-feed pump has a gas-expansion turbine, utilizing the pressure drop in the fuel gas to the boilers, on one end of the shaft and a steam turbine on the other. The spare boiler-feed pump is driven by a steam turbine.

Boiler makeup water is demineralized in a two-bed acid and caustic-regenerated ion-exchange unit. Water requirements are small, as condensate return is virtually 100%. Chemical mix tanks and injection pumps permit internal treatment to be applied to the boilers or deaerator storage tank.

Cooling-water system. Three induced-draft cooling-tower cells cool 15,000 g.p.m. of water to a maximum temperature of 90° F. A horizontal turbine-driven water pump circulates water through the plant system. A full spare is provided. The water is first run through cold services and reused for hotter services. Total temperature rise is about 26° F. The cooling-tower water is treated continuously with acid and inhibitor.

Recompressors. Three reciprocating compressers of 330 b.hp. each are provided to compress excess vent gas to the sales gas line. Two of these machines operate, with a third for spare. The units are housed in a compressor building, with instrument-air and starting-air compressors. Jacket water and lube oil are cooled by heat exchange with cooling-tower water.

Electric power is supplied from two 1,000-kva., 440-volt generators driven by steam turbines. One machine is a spare. Two automatic-starting 125-kva. emergency gas-engine-driven generators are provided for use during startup, and to keep the large-turbine lubricating oil pumps running for a short time following shutdown.

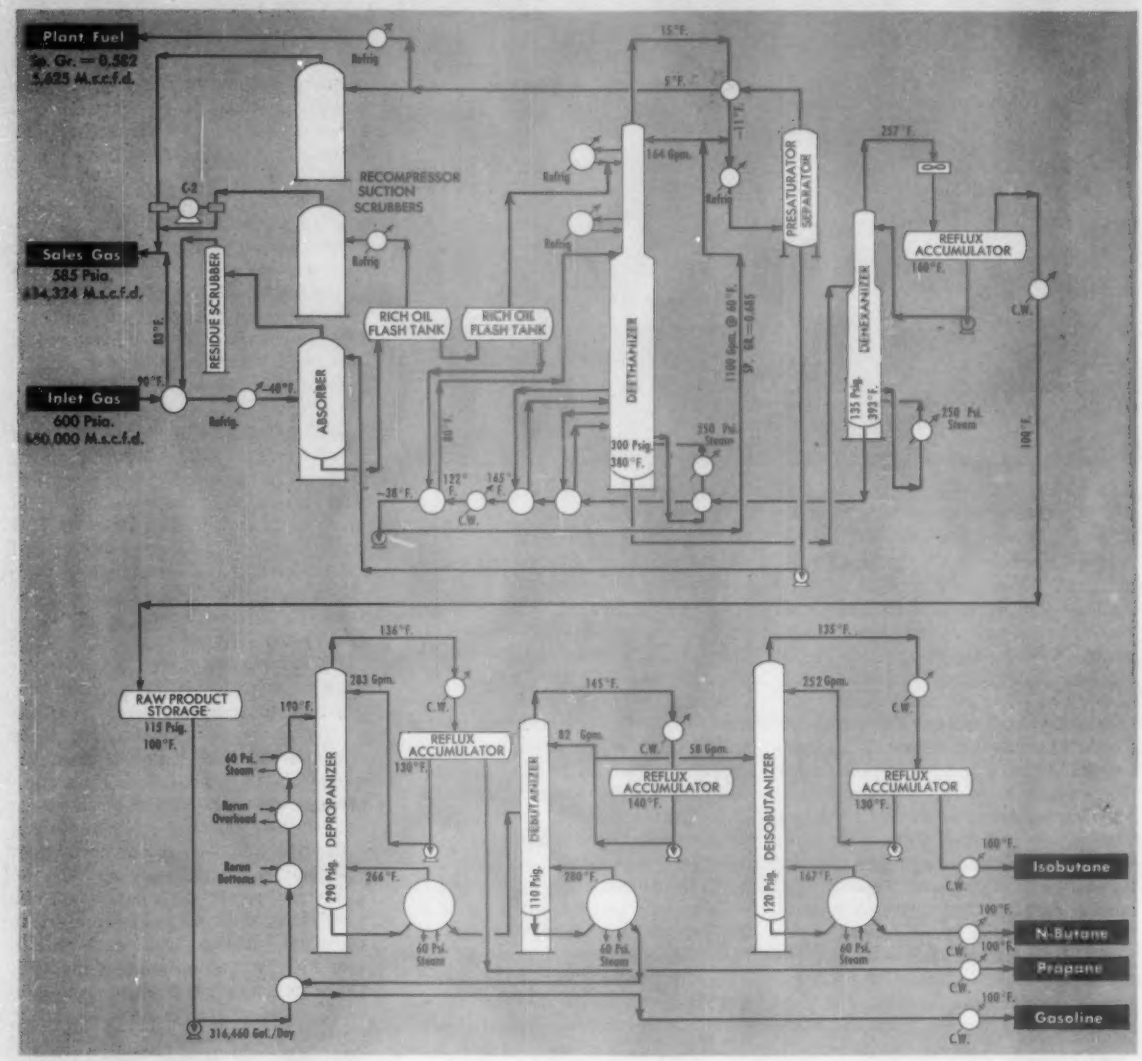
HYDRAULIC TURBINE, utilizing pressure drop in rich oil from absorbers, is shown on the near end of this high-pressure lean-oil pump. A steam turbine is on the other end.

TABLE 1—PLANT DESIGN BASIS

Comp.	Mole % Inlet gas	Mole % Sales gas
N_2	0.23	0.24
CO_2	0.70	0.71
C_1	94.24	95.73
C_2	3.20	3.22
C_3	0.98	0.10
iC_4	0.21	...
nC_4	0.19	...
iC_5	0.07	...
nC_5	0.06	...
C_6+	0.12	...
Total	100.00	100.00
M.M.s.c.f.d.*	650.0	634.3

*Measured at 60° F. and 15.025 psia.

"Present production is about 300,000 gal. of products per day."



CHILLING the light absorption to —40° F. allows the plant to recover more than 90% of the propane contained in the inlet gas.

Other equipment. Gas heat exchangers and high-pressure main-gas piping are specially designed to operate with a total over-all plant pressure drop of less than 15 psi. This includes inlet and outlet meters.

All fractionators and absorbers are equipped with valve trays. The deethanizer and dehexanizer have once-through reboilers. Other reboilers are kettle type. The oil and gas chillers are also kettle type, with vaporizing propane in the shells.

Controls. A central air-conditioned control room houses flow, pressure, and temperature instruments for plant control. Meters for fuel-gas, products, and refrigeration-system flows are locally mounted. Controllers are pneumatic, except that the deisobutanizer temperature controller is electronic. A multipoint push-button pyrometer permits temperature readings from critical points all over the process area.

An air-conditioned meter building houses inlet and outlet gas flowmeters, gravity recorders, and calorimeters.

Two automatic recording-chromatographs continuously sample and analyze deethanizer overhead gas, propane, isobutane, normal butane, and gasoline. These instruments can be scheduled to run other samples.

Shutdown systems. Several strategically located stations permit manual depressuring of a pneumatic header to shut down boilers, recompressors, and bypass the plant inlet gas. This system can also be actuated by high liquid level in the absorber-residue scrubbers. Resulting power failure automatically starts one emergency generator, which runs oil pumps supplying cooling to the large turbine bearings, and makes power available for lighting and start-up.

Storage and loading facilities. Propane and butane are stored in 12 horizontal tanks with a total capacity of 876,000 gal. Gasoline is stored in three 182,000-gal. spheroids. Approximately 3 days' storage is provided for propane, 5 for butane, and 8 days for gasoline.

Pipeline pumping facilities can handle the entire daily propane and butane production for rail loading or injection into underground storage at Breaux Bridge, La.

Four spots for truck loading are available at the plant, each to handle any product. Truck loading pumps have 200 g.p.m. capacity.

OIL-WELL PUMPING
PART 24

BY JOSEPH ZABA

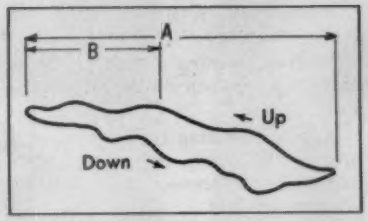
Find plunger travel from dynamometer cards

AT VERY SLOW pumping speeds the stretch of rods and the actual plunger travel may be found, in some cases, directly from a dynamometer card. For the card shown in Fig. 28, the plunger stroke would equal: [1]

$$S_p = S_{pr} \times B/A$$

Where:

S_p = plunger stroke
S_{pr} = polished-rod stroke



PLUNGER STROKE from dynamometer card. Fig. 28.

However, at speeds generally used in pumping operations the dynamic forces distort the shape of a dynamometer card to such a degree that the stretch of the rods is not easily recognizable in the diagram.

Conditions of severe over or undertravel are obvious in dynamometer cards. In case of overtravel, caused by high pumping speeds, the spring action of rods causes the plunger to travel faster than the polished rod. This results in decrease of loads during the upstroke and increase on the downstroke. The card has a characteristic tilt downward from the beginning of the upstroke, Fig. 29A.

In case of undertravel, which may be caused by excessive plunger or rod friction, or by a plunger too large for the size of rods used, the load continues to increase on the upstroke. This occurs even in the last stages of the upstroke when deceleration of rods should result in decrease of loads. The card for such conditions has a characteristic slope upward from the beginning of the upstroke, Fig. 29B.

Emory N. Kemler suggested an approximate method of determining the actual plunger travel from the dynamometer cards,[2, 3] The method assumes that the closing of the standing valve takes place at about the same point, after the beginning of the downstroke as the closing of the traveling valve after the beginning of the upstroke. Quite often the closing of the traveling valve is recognizable in the card. If the load, from the dynamometer card, is higher at the beginning of the upstroke of the plunger than at the beginning of its downstroke, then the rods were stretched more at the beginning than at the end of the upstroke. This shortening of the rods was translated into additional travel of the plunger in relation to the polished rod, or overtravel.

By calculating stretches of rods corresponding to the loads of the upstroke and the beginning of the downstroke and adding the difference to the polished-rod stroke, approximate plunger travel can be determined. Conversely, if the load as shown by the card, is lower at the beginning of the plunger's upstroke than at the beginning of its downstroke, then the rods became longer during the upstroke. Part of the polished-rod travel went into stretch of rods with the resulting loss of plunger stroke. By calculating the difference in stretches and subtracting this difference from the polished-rod stroke, approximate plunger travel can be found.

J. C. Slonneger presented a method of analysis of dynamometer cards to find plunger travel.[4] The method, based on certain simplifying assumptions, gives only approximate results. It is of interest, however, because it permits plotting of a continuous curve of the plunger's stroke.

The motion of the polished rod is plotted as a sine curve, so placed in relation to the card's diagram that the instanteous loadings can be found directly for any point of the polished-rod travel. The rod stretch, corresponding to selected loads, is then read from an appropriate chart. The stretches, subtracted from or added to the curve of the polished-rod travel, give the curve of the plunger motion.

In the example used to illustrate the method conditions of undertravel are presented. The curve of the plunger motion is not as smooth as that of the polished-rod motion, with plunger actually stopping during a portion of the pumping cycle.

Plunger travel - dynagraph cards. Analysis of the plunger stroke from the subsurface dynagraph cards has been already mentioned in Part 5 of this series. Dynagraph studies conducted as far back as 25 years ago showed the extreme complexity of the problem of the plunger motion. They also revealed that complexity increases with increased depth of pumping. Despite intensive studies over a long period of time, much remains to be learned about the subject. Increasing depth of pumped wells makes continued study necessary.

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3. Emory N. Kemler, "Study of Sucker Rods": International Oil, April 1941, p. 38.
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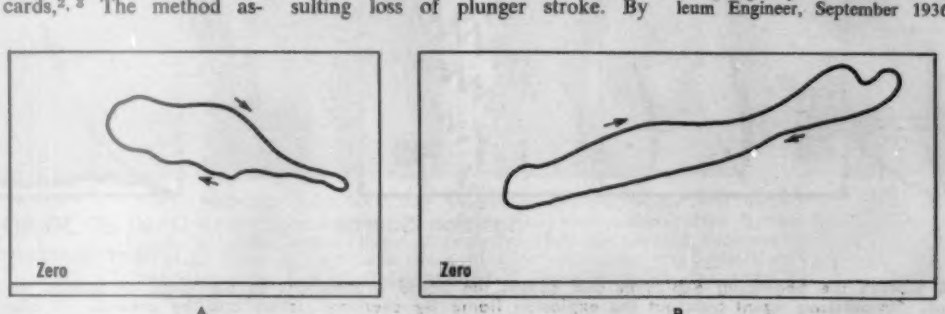


INDICATIONS of overtravel (A), and undertravel (B). Fig. 29.

New technique keeps little explosions from becoming big ones

A NEW TECHNIQUE for suppressing explosions, before they become big enough to be destructive, has been developed to the stage that it is commercially available.

The new system offers active, rather than passive, protection. The explosion is detected at the instant of its inception. Then within a few thousands of a second, suppressive steps are taken to literally snuff it out.

Originally developed in England, the method is credited with having prevented losses of several million dollars. There have been no destructive explosions in any equipment protected by the system.

Several test applications have been made in this country by Fenwal, Inc., Ashland, Mass., which has been licensed to handle the system in the U. S. and Canada. One installation is at a crushing operation in a plastics plant of Monsanto Chemical Co., Springfield, Mass. It was successful in reducing the effects of a dust explosion.

How it works. The National Fire Protection Association regards the development as an important adjunct to well-rounded explosion-control programs. Other explosion-prevention and venting safeguards should be continued, it recommends. But explosion suppression takes up where these purely precautionary measures leave off.

In Fenwal systems, each of which are designed for specific needs of the protected process or equipment, blasts are made harmless by a combination of actions. These include:

Suppression by envelopment of the explosion with a suppressant.

Venting, opening a path to the atmosphere for controlled relief of pressure.

Advance inerting by suppressant in areas remote from the source of the explosion, to prevent secondary explosions or fires.

Isolation, blocking the explosion from other areas.

Automatic shutdown of the plant or equipment.

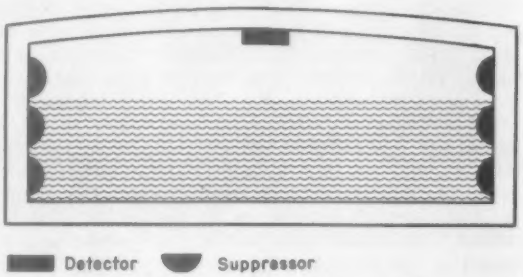
Basic idea of the supression system is shown in Fig. 1. Heart of the system is the explosion detector, which is either a pressure or radiation device. This senses the incipient explosion.

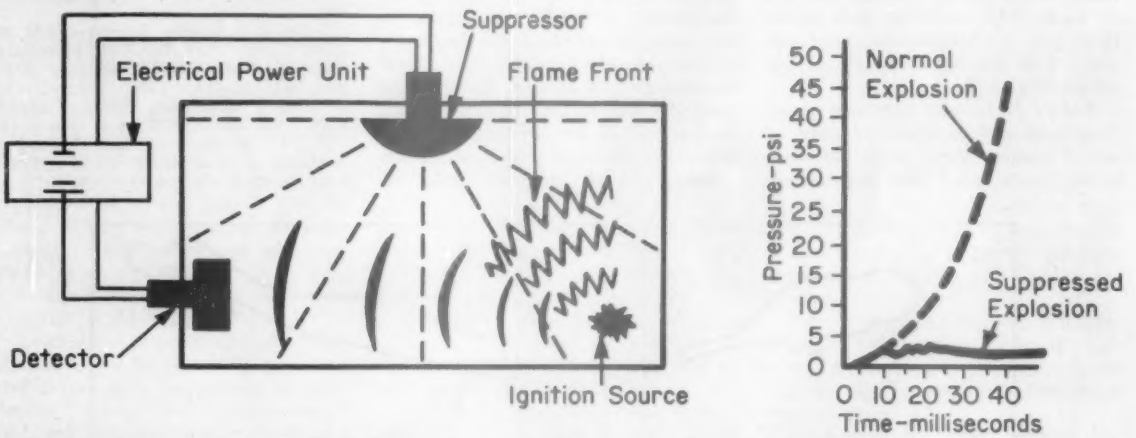
Upon receipt of a signal from a detector, the power unit delivers electrical energy to operate the various suppressors, isolation valves, and vents. These are all operated by explosive detonators so that they are activated in a few thousands of a second. The chart shows a graphical comparison of how the pressure is suppressed, as compared with a normal explosion.

The suppressors, easily ruptured hemispheres or high-rate discharge bottles, dispense liquid suppressants moving at speeds up to 600 ft. per second. Water and bromochloromethane are the most commonly used suppressants. Their heat of evaporation cools the incipient explosion, and the enveloping mist inhibits further combustion.

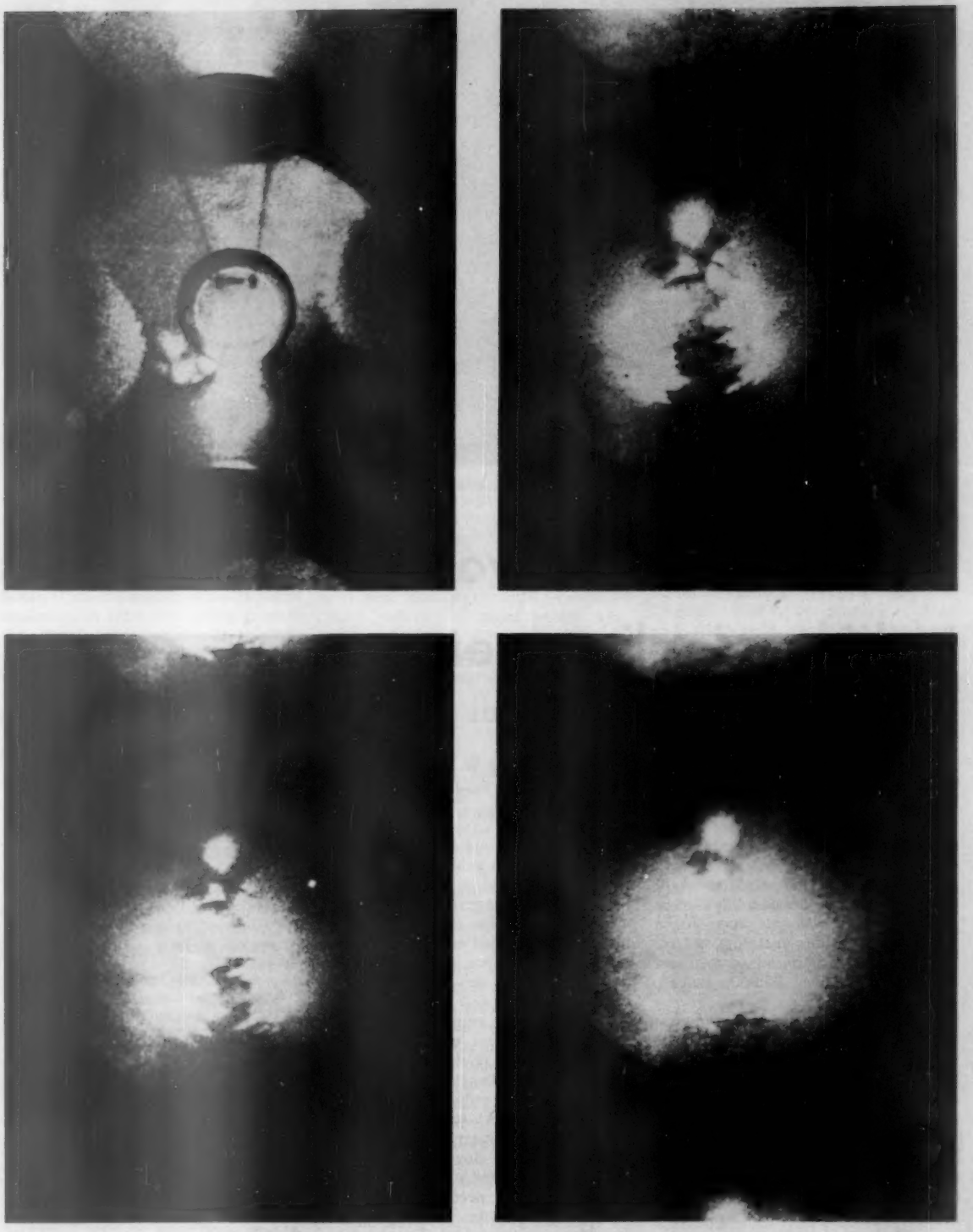
How the system could be applied in a storage tank is shown in Fig. 2. By mounting several suppressors on the inner walls of the tank and a detector on the underneath side of the roof, the system could function regardless of the liquid level in the tank.

PROTECTION system is designed to prevent tank walls from beng burst by an explosion. It is possible to give protection for any liquid level by mounting several hemispheric suppressors on tank's inner walls. Fig. 2.

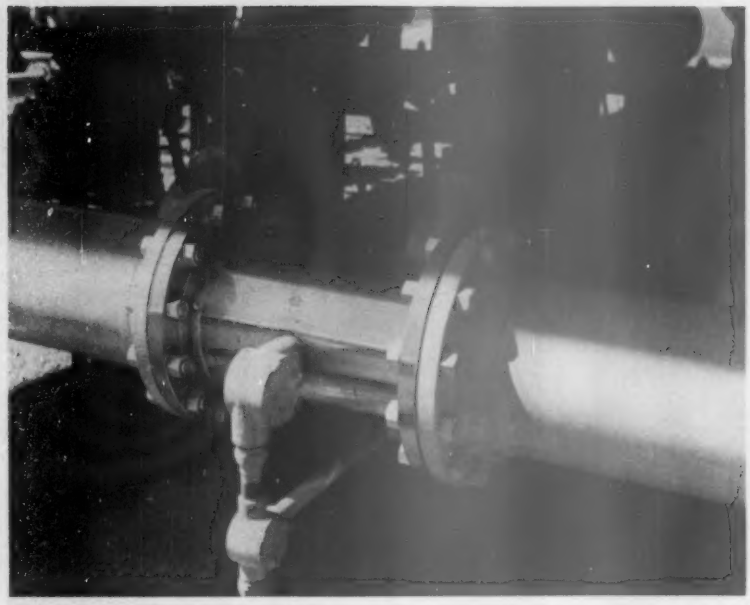




DETECTOR SENSES the beginning explosion and causes the liquid suppressant to discharge at speeds up to 600 ft. per second. Suppressing agent puts out the explosion flame by chemical action and by cooling. It also inerts the unburned explosive mixture. Graph compares normal explosion curve and a suppressed one. Note the low pressure attained in a suppression. Fig. 1.



STILL PHOTOS, taken at 1,000 frames per second, show how quickly an explosion can be snuffed out. A few milliseconds after ignition (top left), the hemispherical suppressors start discharging suppressing liquids. Succeeding frames show the mist enveloping the fireball until at lower right it is all but extinguished. Time involved—less than 50 milliseconds. Fig. 3.



TEN-INCH TURBINE METER on 18-in. gasoline line with maximum throughput of 8,400 bbl. per hour. Fig. 1.

Low initial cost favors turbine pipeline meter

Plantation, with eight operating, finds them OK

BY WILLIAM W. HOLT, JR.
Plantation Pipe Line Co.

LARGE CAPACITY turbine-type meters have a distinct advantage in initial cost over the single positive displacement meter or a bank of small p.d. meters. And, while the installation costs of the turbine and single p.d. meters are about the same, those of the bank would be considerably higher.

Here are approximate costs for a 10,000-bbl. per hour metering system:

Turbine meter: Initial cost, under $6,000; installation, $5,000; total, under $11,000.

Single positive-displacement meter: Initial cost, over $25,000; installation, $5,000; total, over $30,000.

Bank of 1,500-bbl. per hour p.d. meters: Initial cost, $16,000, installation, $15,000; total, $31,000.

Highly accurate. The turbine meter is a satisfactory device for measuring the volume of refined products. Its accuracy and repeatability are excellent. The same precautions, procedures, and techniques used for satisfactory positive-displacement-meter operation must be observed.

A turbine meter consists of a rotor with turbinelike blades in which permanent magnets are imbedded. The outer case is nonmagnetic stainless steel on which an induction-type pickup coil is mounted in the plane of the rotor. As the magnets pass this coil an electrical impulse is generated. The impulse is amplified and used to drive a digital counter or converted to an e.m.f. signal for driving rate indicators, recorders, and control instruments. Counting impulses imposes a very slight, constant load on the rotor and, therefore, is readily compensated for with the mechanical factor.

The number of pulses varies directly as the flow and, as a result, rate instrument scales are linear.

Upstream and downstream conditions are critical and sufficient straight pipe lengths are necessary. A minimum of 10 diameters upstream and 6 downstream are required. The counters can be located up to 1,000 ft. from the meters. The connecting cable is two-conductor, No 18 shielded with a rubber or plastic jacket. The turbine element can be installed directly in the line pipe but should have some type of filter upstream to protect the blades from large objects.

Testing since '57. In 1957 Plantation Pipe Line Co. began testing a large turbine-type meter at its Baton Rouge, La., pump station. This station pumps from tankage to two 18-in. diameter and one 12-in. diameter pipelines. A 10-in. diameter meter was installed on the 18-in. gasoline line which has a maximum pumping rate of 8,400 bbl. per hour. Calibration could be made with an existing bank of eight positive-displacement meters as a standard. Two counters were located in the control room. The distance between the meter and counters is 720 ft. A bypass allowed the turbine to be removed from the stream and inspected without interrupting operations.

During the first few months of testing, the mechanical factor (barrels per count) was erratic. This was traced to unstable factors in individual positive-displacement meters in the master meter bank. It was corrected by calibrating individually at exactly 1,000 bbl. per hour and controlling the pipeline rate closely to multiples of 1,000 bbl. Results of the calibration runs are shown in the accompanying table. The table on gasolines shows the extremes in factor are 1.0169 and 1.0159 with an average of 15 being 1.0163 The median is 1.0162. The factor 1.0169 quite obviously was caused by a leaky valve, poor p.b. bank standard, or human error because in 11 succeeding tests it is well within the required limits.

Inspection results. This meter was removed four times for inspection. Once a corrosion test coupon came loose and lodged in the turbine. The meter was shipped over 2,000 miles by air freight, disassembled, inspected, and returned to operation. The next calibration gave a factor of 1.0162.

CALIBRATION RUNS
Show results within required limits

Date	Gasoline gravity	Rate bbl./hr.	Factor X 10
9-27-58	57.1-62.8	7,200	1.0160
9-28-58	59.7-62.5	7,175	1.0165
9-30-58	57.6-62.3	6,945	1.0160
10- 1-58	60.1-63.6	7,750	1.0169
10- 2-58	60.1-61.8	7,750	1.0162
10- 5-58	60.8-61.9	7,775	1.0159
2- 3-59	65.0	7,850	1.0162
2- 4-59	60.1	7,850	1.0164
2- 4-59	61.7-60.9	7,850	1.0164
2- 5-59	61.0-61.6	7,800	1.0163
7- 9-59	64.3	7,100	1.0163
8- 5-59	50.2-63 6	7,750	1.0160
11-13-59	62.4	7,100	1.0163
1-27-60	60.7	7,200	1.0164
4- 7-60	62.1	6,100	1.0162
	Kerosine		
10- 8-58	42.6-43.6	7,000	1.0148
10- 9-58	41.9-43.1	6,700	1.0149
1-20-59	42.0-42.8	7,000	1.0147
1-26-60	42.5-42.8	7,000	1.0144

COUNTER CABINET, reference tables, and calculator speed corrected volume computations with multiple meters. Fig. 2.

An inspection of the meter in July 1960, after having passed more than 200,000,000 bbl. showed that bushings and pivots were worn but did not need immediate replacement.

The remote reading feature of the counters has definitely been established as an important saving in manhours. Other advantages in pipeline operations are:

1. Batches are conveniently forecast by count (volume) instead of by rate and time.
2. Volumes pumped are quickly determined (15 to 20 seconds).
3. The "OS" reports are made without leaving the control room.

Other Operational Turbine Meters

As a result of the experience with the test meter, others have been installed and in operation for over 18 months. The location, size, and capacity are shown in an accompanying tabulation.

LOCATION AND SIZE OF METERS

Station	Line	Meter size, in.	Meter capacity, bbl./hr.
1. Baton Rouge	12-in.	8	7,400
2. Baton Rouge	18-in. fuel	8	7,400
3. Bremen, Ga.	4-in. Columbus	3	1,000
4. Bremen, Ga.	4-in Macon	3	1,000
5. Bremen, Ga.	10-in.	6	4,300
6. Bremen, Ga.	14-in gasoline	8	7,400
7. Bremen, Ga.	18-in gasoline	10	10,000

All have standard ASA 150-lb. raised face flanges. Two pickup coils are mounted 180° apart, and separate shielded pairs of conductors are installed between the pickups and the counters. A 10-in. meter installation is shown in Fig. 1 on preceding page.

Where a large number of meters are in service, a cabinet for the counters, reference table, and calculator have greatly facilitated the corrected volume computations. Such an arrangement is shown in Fig. 2.

Since the counters require 35 watts, sufficient heat is generated to damage them seriously if there is not adequate ventilation. The cabinet has a small 1/10 hp. blower for air circulation which is ample for cooling. The counters should be spaced farther apart vertically for longer service life.

The small 3-in.-diameter meters are calibrated to the 20-bbl. prover tank using the same procedures as p.d. meters. First results were relatively poor. The stainless-steel rotor has been replaced with one of anodized aluminum and the repeatability is now superior to that of the p.d. meter. On one occasion nine stops and starts during the 20-bbl. run produced a factor that was acceptable.

Factor effects. Varying upstream conditions produce a definite effect on the factor. A p.d meter operating upstream changed the turbine factor by 20 points. Repeatability was still good for either condition. To overcome this, an upstream section with straightening vanes is proposed. If it stabilizes the factor when different upstream conditions exist, it should be possible to move sensing elements from one location to another without recalibration.

The service life of the bushings in the 10-in.-diameter turbine meter, located at the end of a trunk line, has been set at approximately 60,000,000 bbl. Plantation's 18-in. gasoline line terminates at Bremen, Ga., which is 431 miles from the initial station at Baton Rouge. The meter at Baton Rouge has exceeded 200,000,000 bbl., but the one at Bremen has had two sets of replacement bushings in 120,000,000 bbl. The cost of parts, labor, and transportation for the repair is approximately $300. The meter was out of service for 5 days. These failures are definitely caused by an accumulation of abrasive pipeline rouge in and around the pivots and bushings. Flush lines have improved this condition to undetermined extent. Filteration is impractical because the particle size is in the order of 1 to 5 μ and concentration is extremely low.

Conclusions

The flow-rate range of the turbine meter is good from 100% down to at least 40% of rated capacity. Mechanical factors must be established for various ranges of gravity. At present, calibration tests every 60 to 90 days seem ample, but in particular installations this can be extended as experience dictates.

Two pickup coils and two counters should be used to better utilize the operational advantages. Remote registration aids in establishing exact batch sizes and the determination of tank bottoms and line displacements. Counters should be properly spaced and adequately ventilated for good service life.

This type of meter will pass all normal pipeline dirt without difficulty. Large objects that will not pass through the blades affect the factor and can damage the turbine. When this occurs the object can normally be heard and the mechanical factor will immediately be reduced. This is caused by a reduction in area which increases the velocity through the turbine.

Mechanically, the turbine installation should include:

1. Straightening vanes in the approach piping.
2. Flush lines to the pivots and bushings.
3. Anodized aluminum rotor.
4. A mechanical factor that is near a decade; that is, 0.1, 0.01, 0.001, etc., barrels per count.

As for any meter, the calibration system should offer a high degree of accuracy. Higher capacity meters should be tested under steady flow conditions. Satisfactory runs of short duration will permit additional tests if the factor has changed or an error is encountered.

Common-carrier custody transfer has not been established, but all indications are that this is in the immediate future. There is no reason to doubt that the pipelines and their customers will accept this instrument as readily as any other type.

How to analyze your gas-lift wells

• There's more to putting a well on gas lift than just running some valves on the tubing. An immediate thorough check should be made of the installation, followed by periodic checks of the efficiency of the operation. This article tells how to run these checks, and what to do to correct any troubles that are found.

BY KERMIT E. BROWN
and
CARLOS CANALIZO

WHAT DO YOU DO after you install your gas-lift equipment?

Set it and forget it?

Or do you follow the job with periodic checks to be sure that you are getting the most out of the well for the least expense? Have you ever increased the gas-injection rate thinking that this would increase your production? This may actually cause the production to fall off, bringing you less income and higher operating costs.

Presented at the seventh annual West Texas Oil-Lifting Short Course under the original title "Analysis of Gas-Lift Installations." Brown is with the department of petroleum engineering, University of Texas. Canalizo is with Otis Engineering Corp.

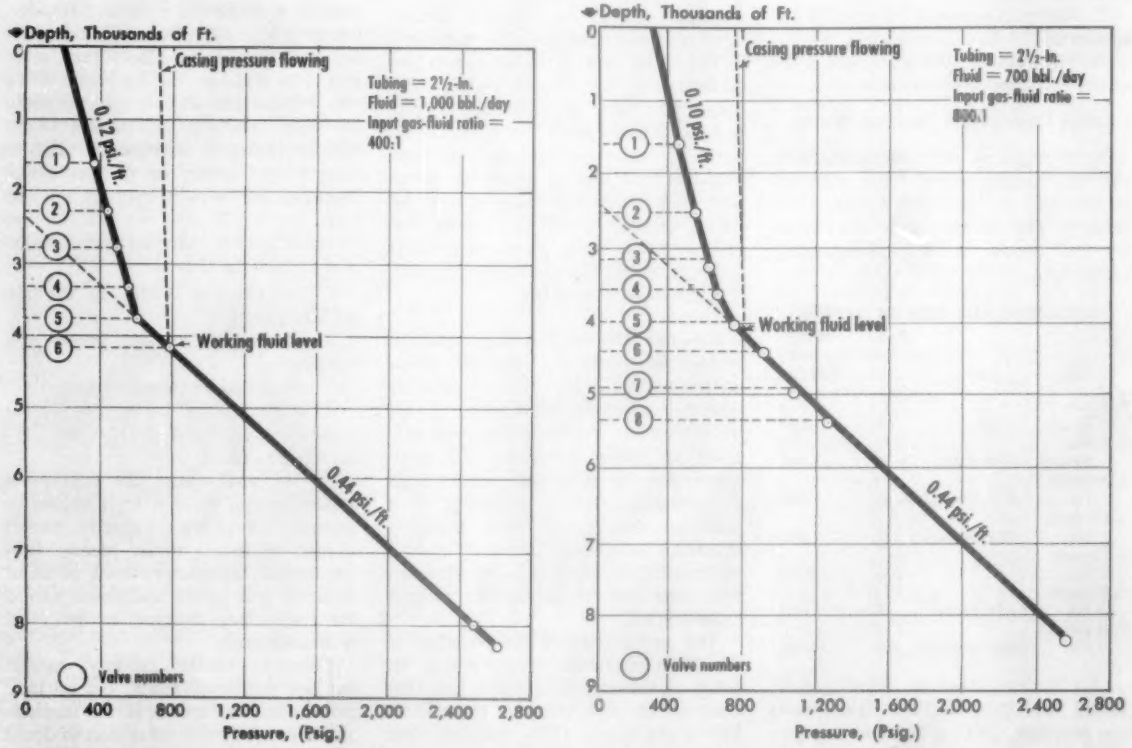
What should be done? There are several methods of analyzing a gas-lift installation. These apply to both continuous and intermittent flow. Some of these are: (1) Pressure survey, (2) flowing temperature survey, (3) fluid-level determination by acoustic methods, (4) recording of both casing and tubing pressures, (5) total fluid recovery, (6) injection gas volume, (7) total output gas volumes, (8) flowing tubing pressures, and (9) miscellaneous other tests.

1. Pressure Survey

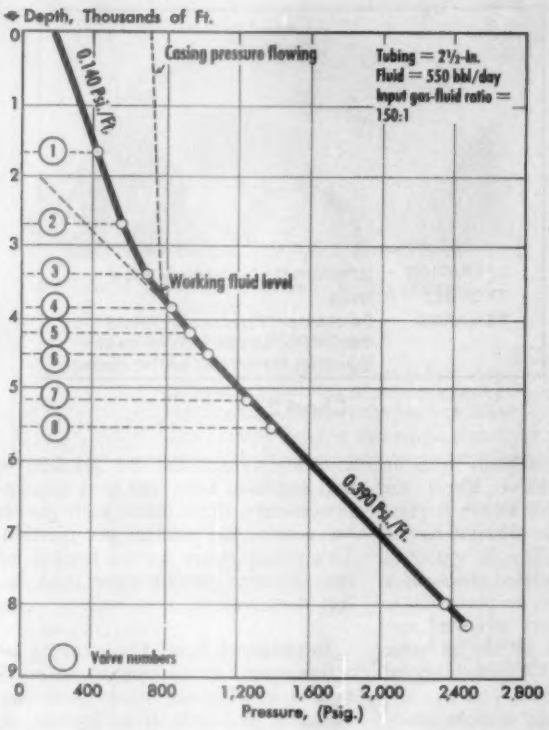
This offers the best means of properly analyzing both types of installation. We will look at the continuous-flow type first.

A common fallacy in running flowing-pressure surveys is to wait until some trouble develops. Admittedly, the trouble can more than likely be located, but vital information as to how to improve the installation will not be obtained.

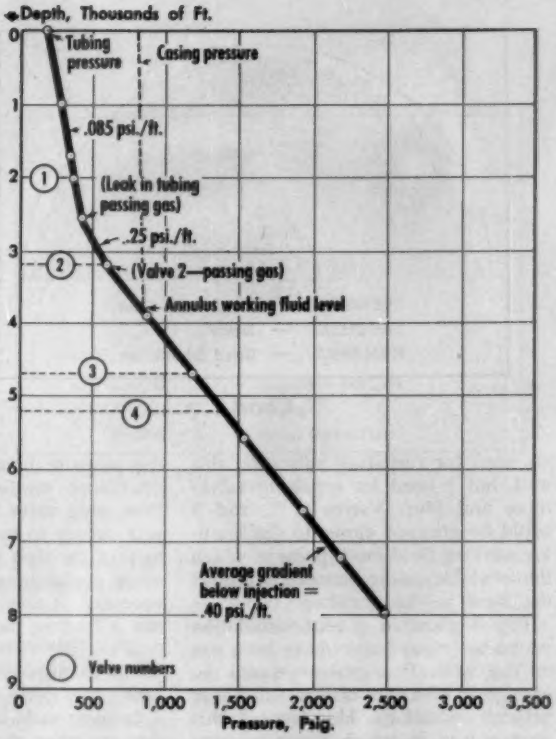
The importance of the correct spacing of gas-lift valves on high-productivity-index continuous-flow wells cannot be overemphasized. Therefore, a pressure survey should be run while



FLOWING-PRESSURE SURVEYS such as these may show the operator where he can improve gas-lift efficiency. In Fig. 1, on the left, the curve shows that valve 6 is too low to open, and that it should be moved up the tubing string. In Fig. 2, right, too much gas is being injected, and valves 3 and 4 should be repaired.



THIS FLOWING PRESSURE SURVEY shows that there are too many valves in the well. Four valves would be enough, unless the water cut were expected to increase. Fig. 3.



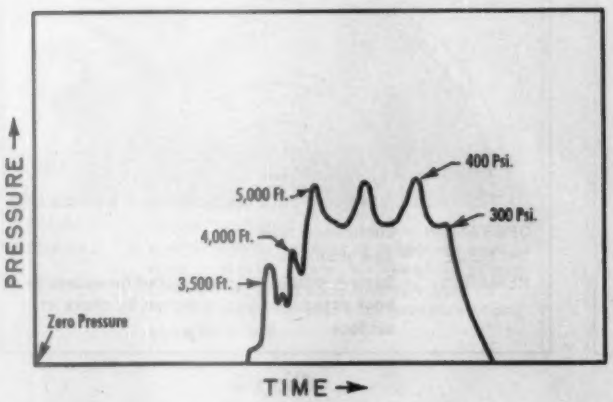
THE ABRUPT CHANGE IN GRADIENT here shows that there is a leak in the tubing. In flowing pressure survey like this, a leaking valve can be found in the same way. Fig. 4.

the well is performing satisfactorily. This type of information will in turn lead to a correct respacing of gas-lift valves.

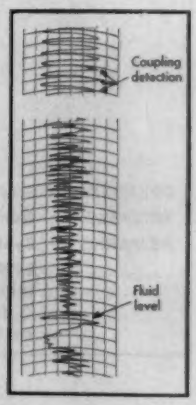
A common error on valve spacing is failure to space valves close enough together. On wells producing from an active water drive and having high PI's, it is advisable to space valves as close as two or three tubing joints apart (60 to 90 ft.).

Fig. 1 shows a well making 1,000 bbl. per day of oil and water (90% water). From all surface indications the well was performing satisfactorily. However, from the flowing-pressure survey it was evident that a change in valve spacing should greatly increase total fluid production. Note that the fluid level in the casing lacks only a few feet of uncovering the last valve with the available line pressure. Since this well had a PI of 10 or greater, the valves were respaced by placing the last valve in a position where it could be operated (approximately 60 ft. back up the string). By checking the static fluid level it was possible to relocate valves 1 and 2 as the last two valves in the string and spacing them three and two tubing joints apart respectively. Production rate on this well was increased to 1,600 bbl. per day. Since this was an active water drive with the field showing very little drop in pressure with time, the spacing was satisfactory for 1½ to 2 years.

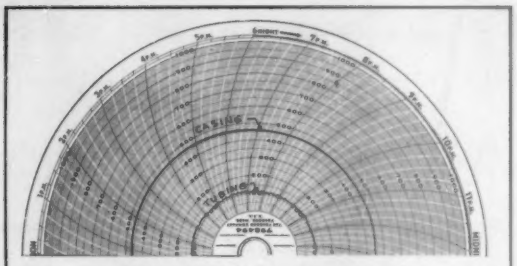
Fig. 2 shows a well where two or three gas-lift valves are admitting gas, showing valve interference. A check on the flowing gradient above the point of gas injection shows that too much gas is being injected. This was also confirmed by a measurement of the input injection gas-liquid ratio of 800:1 as compared to 400:1 for the well of Fig. 1. There seems to be



TYPICAL flowing pressure survey for intermittent gas-lift operation. Fig. 5.

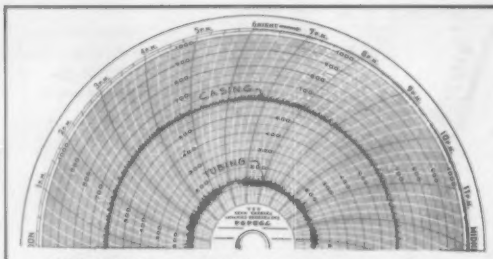


TYPICAL well sounding survey. Fig. 6.



OPERATION — Continuous Flow
TROUBLE — None
REMARKS — Good Operation

Chart 1



OPERATION — Intermittent - Continuous Flow
TROUBLE — None
REMARKS — On constant injection well fluid emulsified, on short intermittent injection the emulsification ceased.

Chart 2

no need for respacing valves on this well, but a need for repairing valves three and four. Valves 6, 7, and 8 could be grouped closer to the annulus working fluid level (point to which the available casing pressure depresses the fluid in the annulus).

Fig. 3 shows a gas-lift installation where too many valves have been run in the well. Four valves would be enough to take care of this well under present conditions. However, if this were a well in which water cut was expected to increase, thereby resulting in a lower annulus working - fluid level, the use of lower valves would be justified. An input gas-oil ratio of 150:1 indicates an efficient installation.

Another useful purpose of flowing pressure surveys is to locate a leak in the tubing. This is easily noted by an abrupt change in gradient at the point of the leak, Fig. 4. Leaking gas-lift valves can be detected in the same manner.

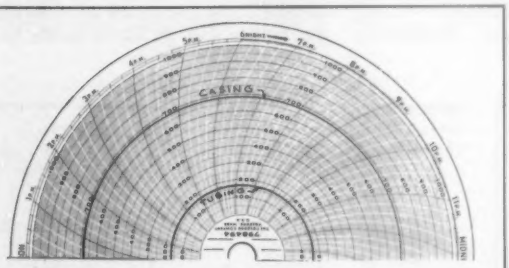
Some precautions. The well should be prepared on the day prior to the survey by placing the lubricator for the pressure bomb in place with an additional master valve above the flow wing valve. This allows a pressure survey to be run without having to shut the well in. This is important since complete stabilized flow is a necessity. It may also be necessary to run a lead or mercury weighted section on the bottom of the pressure bomb to minimize the possibility of losing the instrument.

In some wells it may even be necessary to shut the well in, run the bomb to bottom as fast as practical, and then open the well again. After the well has stabilized, the survey can be started up the hole. Since the highest fluid velocities occur near the top of the tubing string it is likely that the survey can be completed except for the last 200-300 ft. of the string. The wire-line operator can detect a slackening in the line at the point where the fluid velocities are trying to pick up the bomb. The important section of the tubing string (above and below the point of gas injection) will have been surveyed successfully.

It is a good idea to stop every 500 to 1,000 ft. below the point of gas injection to establish the gradient in that region of flow, and then stop approximately 10 ft. below each gas-lift valve above the point of gas injection. This would assure correct location of the operating gas-lift valve, and detect valve leaks.

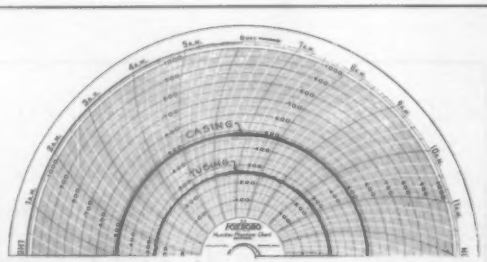
Intermittent flow. The running of a flowing-pressure survey in an intermittent installation, and in particular one that is lifting from bottom or from a chamber, offers more of a problem than does running a survey on a continuous-flow well. However, if the bomb can be run beneath the operating valve or placed on a bomb hanger (tool to hold the recording pressure gage in place) there is no danger of blowing the bomb up the hole.

Valuable information can be obtained from a pressure survey in an intermittent well. Pressure buildup between cycles, as well as the bottom-hole pressure immediately after each cycle, can be obtained. By knowing the position of the operating valve, the amount of slippage or fallback can be determined. In turn an average



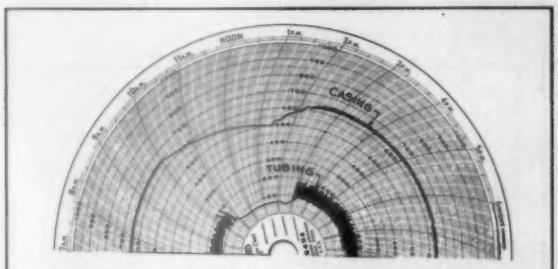
OPERATION — Continuous flow
TROUBLE — None
REMARKS — System should be investigated for possibilities of lowering the flowing tubing pressure if additional production is desired. Gas injection by choke at surface.

Chart 3



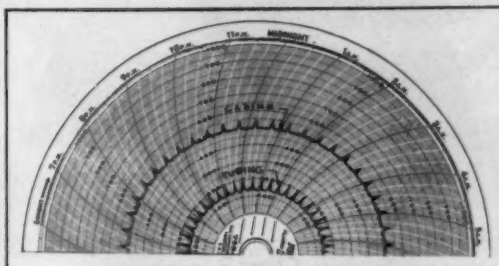
OPERATION — Continuous flow
TROUBLE — Low production
REMARKS — System should be investigated for excessive back pressure. Gas injection by choke at surface.

Chart 4



OPERATION — Continuous Flow — Tubing Controlled Injection
TROUBLE — Freezing in injection gas line.
REMARKS — Freezing of injection gas line and subsequent lowering of casing pressure indicated a leaking valve. (Not serious) Line thawed out and well again stabilized.

Chart 5



OPERATION — Intermittent Lift
TROUBLE — None
REMARKS — Good Operation

Chart 6

drawdown can be established for a particular well allowing PI calculations. A pressure-buildup curve can also be obtained.

Fig. 5 shows a typical pressure survey as conducted in an intermittent-flow well. For this particular well the survey disclosed a partial water block since the survey showed the well to be producing from the bottom valve, and making very little total fluid.

2. Flowing Temperature Surveys

A flowing temperature survey can be valuable in locating tubing leaks as well as locating the operating gas-lift valve. However, a flowing temperature survey is not as valuable as a pressure survey. In most instances it would be preferable to run a pressure survey because it will pick up valuable pressure-gradient data leading to PI calculations from drawdown information. The pressure survey will also locate a tubing leak easily on continuous-flow wells, but with possible difficulty on intermittent wells.

3. Fluid-Level Determination by Acoustic Methods

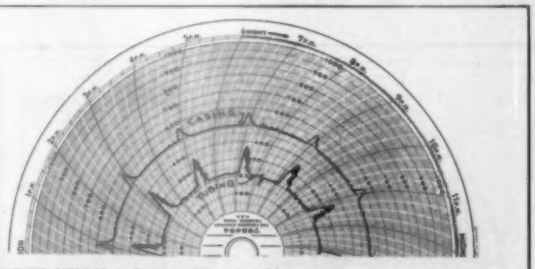
A fast way of finding the fluid level in the annular space is by sounding the well. However, caution should be used in wells containing a packer. It may be that the well originally unloaded to the bottom valve, and later a valve up the hole lost some of its original charge. Although the acoustic device would show the well unloaded to the last valve, it could be possible that a valve back up the string would actually be the operating valve.

Also many wells originally placed on lift will require additional drawdown in the first stages of lift, thereby unloading the annular space of fluid. These same wells, after several days of production from a lower valve, may then operate from a valve higher up the string.

The acoustic device is well suited for continuous-flow installations without a packer. The annular working-fluid level could be easily detected in this manner. A valve losing pressure and causing the fluid level to rise to that point could be easily detected. It would be more satisfactory to take periodic soundings when the well is performing satisfactorily. This would allow for comparisons of changing fluid levels.

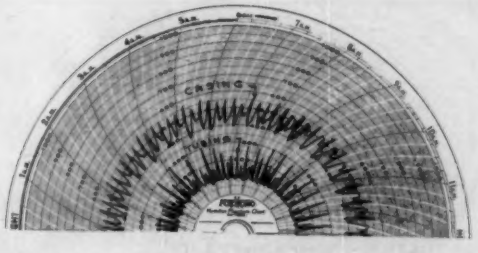
For intermittent wells without a packer, where it is known that the well should be operating from the bottom valve, a sounding would be an immediate check. If the fluid level has moved back up the string a valve pressure loss could be suspected. Of course, a packer is normally run on an intermittent well and the lowest fluid level attained during the artificial-life period would be the level determined with the sounding device.

Fig. 6 shows a typical acoustic survey.



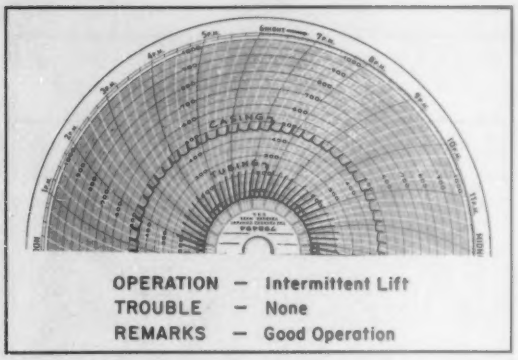
OPERATION — Intermittent Lift
TROUBLE — Cycles too long.
REMARKS — Well should be capable of producing more fluid on shorter cycles. Well heading at end of slug indicating excessive fall-back of fluid. Reason for high trap pressure should be determined.

Chart 7



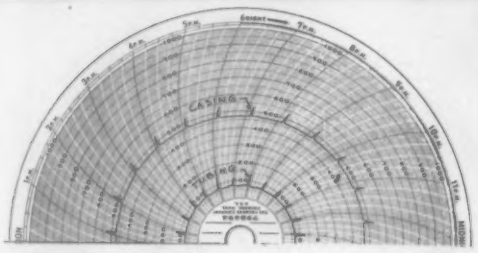
OPERATION — Intermittent Lift
TROUBLE — Alternating valve operation with lower valve leaking, or tubing leak below upper valve.
REMARKS — Longer cycling might prevent injection at the lower point of operation.

Chart 8



OPERATION – Intermittent Lift
TROUBLE – None
REMARKS – Good Operation

Chart 9



OPERATION – Intermittent Lift
TROUBLE – None
REMARKS – Good operation – Low productivity well.

Chart 10

4. Recording Casing and Tubing Pressures

One of the cheapest ways of keeping an accurate check on a gas-lift well is to obtain daily recordings of both the tubing and casing pressure. We feel that a two-pen recorder should be placed on every gas-lift well. Many improving adjustments of surface controls can be made after a careful study of two-pen recording charts. These charts apply to both continuous and intermittent flow. If the recorder is placed on the well as soon as valves are installed, the actual unloading of the well as it lowers from valve to valve can be observed on the chart.

Some of the important factors to be noted from a record of the tubing and casing pressure are:

1. Increased surface flowing tubing pressures would indicate scale or paraffin deposition in the flow lines or possibly in increased trap pressures.
2. A continuous-flow well on tubing control could start flowing from its own power and this would be noted from the charts.
3. Change from one operating valve to another could be detected.
4. Sanding up or water blocking of a well.
5. Leaking gas-lift valve.
6. Leak in tubing.
7. Too long or too short injection cycle for intermittent flow.
8. Excessive fallback or slippage in intermittent flow.
9. Excessive gas usage.
10. Decreased production.
11. Inefficient operation.

Charts 1 through 19 illustrate some of these applications of the two-pen recording of casing and tubing pressures. The problems and troubles given in the explanation are the ones known to exist in the wells at the time the charts were made.

5. Total Fluid Recovery

One important method of analyzing wells is the maintaining of proper production records. One of the first signs of trouble is a loss in oil and/or total liquid production. This method is self-explanatory and should require no further comments.

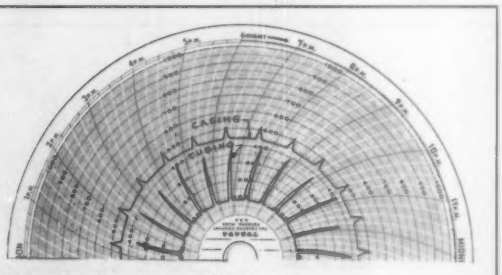
6. Injection Gas Volumes

Every well on gas lift should be equipped with a meter for measuring injection-gas volumes. At least a meter flange should be installed such that a portable meter could be used for spot-checking the gas being used. Normally a continuous-flow well will offer no problem in gas measurement. However, a well on intermittent flow will make recordings on a gas meter chart that are difficult to interpret. This is particularly true for a 24-hour or 7-day revolution clock. Therefore, provisions should be made to obtain combination clocks on the gas meter that can be easily converted to 24-minute clocks (one complete revolution in 24 minutes).

Gas injected per cycle should be recorded on this 24-minute chart, and in turn enough separate "kicks" on the chart should be obtained to secure an average reading. The gas used per cycle can then be calculated. The total number of kicks per day may be counted from the 24-hour chart or obtained from the injection clock settings.

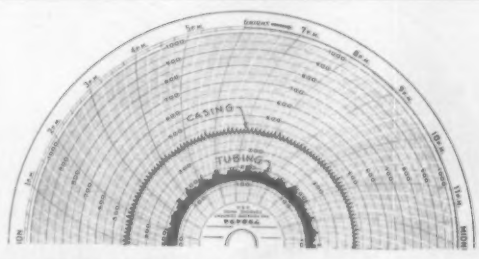
By multiplying the gas used per cycle by the number of cycles per day a close approximation can be obtained for the injection gas-liquid ratios. Again this is information that should be obtained periodically so that an immediate increase in gas consumption can be detected.

There can be any number of rea-



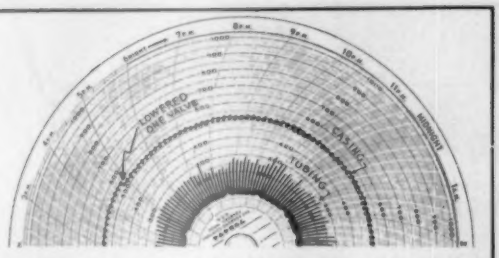
OPERATION – Intermittent Lift
TROUBLE – None
REMARKS – Deep lift (8000 ft.). Tree should be examined for possibility of eliminating high maximum tubing slug pressure.

Chart 11



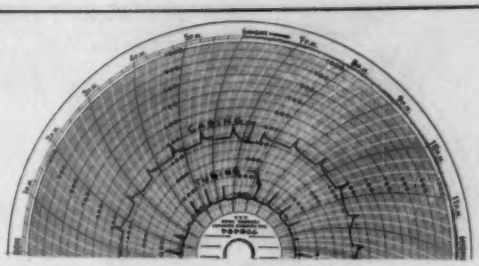
OPERATION – Intermittent Lift
TROUBLE – None
REMARKS – Ten minute cycle for producing at maximum rate on a high productivity, low bottom hole pressure well.

Chart 12



OPERATION — Intermittent Flow
TROUBLE — None
REMARKS — Well lowered one valve as indicated by a drop in casing pressure.

Chart 13



OPERATION — Intermittent operation
TROUBLE — Valve leaking and alternating valve operation.
REMARKS — A shorter cycle will maintain lower valve operation. If valve leakage is too bad, valve will have to be replaced.

Chart 14

sons why gas consumption would increase. For example, a continuous-flow well on casing control (constant gas pressure maintained at surface) might lower itself down to the next lower operating valve. The casing pressure would then attempt to adjust itself to the lower valve setting, but the regulator at the surface would attempt to maintain a constant higher casing pressure. This would result in high gas consumption with the operation of two or more gas-lift valves.

Other troubles would be a leak in the tubing, leaking packer, leak in the christmas tree packoff, etc.

7. Total Output Gas Volumes

In addition to measuring input injection gas, provision should be made for metering the total gas being produced by the well. This in turn allows a check on the input gas-injection meter since the output meter will be measuring injection gas plus produced reservoir gas.

This is important because a well in later stages of production may exhibit a decided increase in produced gas. This gas must be considered since it is performing work on continuous-flow wells and may result in a decided decrease in input injection gas. Integrating instruments should be considered for gas meters where gas-volume calculations become difficult.

8. Flowing Tubing Pressure

In continuous flow the flowing tubing pressure directly influences the bottom-hole-pressure drawdown. For high-PI wells an increase in tubing pressure of 100 psi. could result in a decreased production of several hundred barrels per day. Again a periodic check should be taken on tubing pressures. Any immediate increase in flowing tubing pressure should be investigated. This increase could be caused by small flow lines, restricted flow lines, surface chokes, paraffin, or scale depositions.

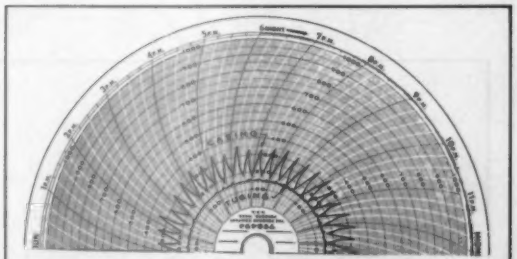
If maximum production is desired, the christmas tree should be streamlined, taking all sharp bends out of the tree and flow lines. If necessary, the surface flow line should be exchanged for a larger line. If the surface flow line is of such length that the tubing pressure is affected, consider the possibility of installing a tubing flow-line booster. This can be conveniently arranged by installing an enclosed gas-lift valve on the surface flow line and using gas pressure to boost flow.

Another important consideration is that in the lower ranges of gas expansion, the greatest amount of work is expended.

Charts 20-23 emphasize the difference in gas volumes and gas-injection pressures needed to produce the same well against back pressures of 50, 100, and 200 psi. respectively. These show the effect of having to produce the same amount of fluid (creating the same flowing bottom-hole pressure of 2,000 psi.) against the three different tubing pressures. In order to further illustrate the effect of back pressure and gas-injection volumes an injection gas-oil ratio of 2,500:1 and 5,000:1 were both used to calculate a flowing gradient above the point of gas injection.

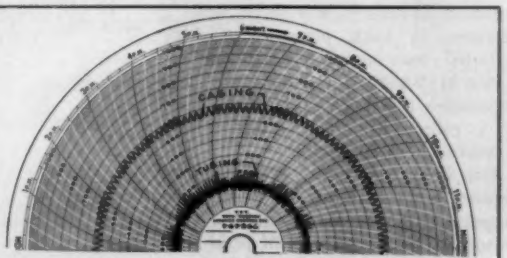
Table 1 summarizes the important factors that should be noted from these three charts.

It is interesting to note that on a



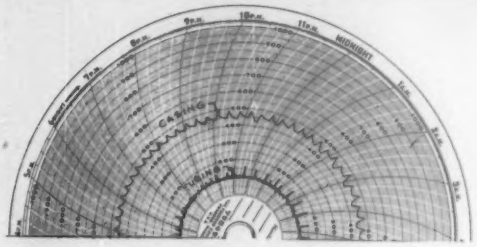
OPERATION — Intermittent Lift
TROUBLE — Gas lift valve cut out, or tubing leak.
REMARKS — Not making production, blowing dry gas.

Chart 15



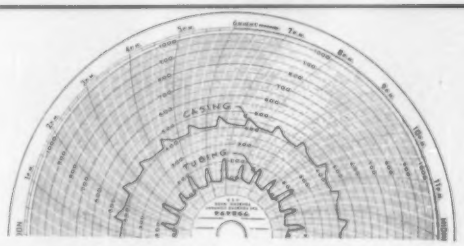
OPERATION — Intermittent Lift
TROUBLE — Gas lift valve cut out or tubing leak.
REMARKS — This is indicated by casing pressure failing to stabilize.

Chart 16



OPERATION – Intermittent Lift
TROUBLE – Questionable
REMARKS – Operation alternating between two valves. For greater fluid recovery, shorten injection cycle to maintain lower valve operation. If well is making allowable, operation satisfactory.

Chart 17



OPERATION – Intermittent Lift
TROUBLE – Tubing restriction, or injection cycle too long.
REMARKS – Remove restriction from tubing or wellhead, or try a shorter injection cycle

Chart 18

2,500:1 GOR with a 50-psig. wellhead tubing pressure, the point of injection is at 2,625 ft., with a surface casing pressure of 525 psig., while on a wellhead tubing pressure of 200 psig., the point of injection is at 4,375 ft., with a surface casing pressure of 1,190 psig.

It is immediately evident that additional horsepower is necessary to obtain the same production from this well for variable surface back pressures.

As a matter of interest Chart 23 shows the reduction in gas volumes necessary as the point of gas injection is lowered. This is for a production rate of 100 bbl. of oil and 900 bbl. of water per day. The importance of higher injection pressures cannot be overemphasized. In analyzing any well, consideration must be given to the injection-gas pressure. In many instances it is impossible to increase total fluid recovery without increasing the injection gas pressure.

Intermittent flow. High back pressure can be expected to retard production on low-bottom-hole-pressure wells. This can be critical on wells having only 150-200-psi. bottom-hole pressure. If this is a high-PI well, a decrease in back pressure of only 5-10 psi. may cause a noticeable increase in production. It is then almost imperative that trap pressure be kept to a minimum on low-bottom-hole pressure, high-PI wells.

For wells with long flow lines that require some choking at the surface to prevent severe surges on the separator, excessive fallback of fluid may be encountered. A wise trick is to place the choke (if one is necessary) at the end of the flow line immediately upstream from the separator. This allows the flow line to serve as a volume chamber preventing excessive fluid fallback.

9. Miscellaneous

There are various well manipulations that can be performed and well conditions that can be checked at the surface to help in analyzing a well.

On continuous-flow wells that normally produce hot fluid to the surface, an immediate cooling of the flow line indicates a lack of fluid entry or too much gas injection. By feeling the flow line on a continuous-flow well, any drastic reduction in production is noted.

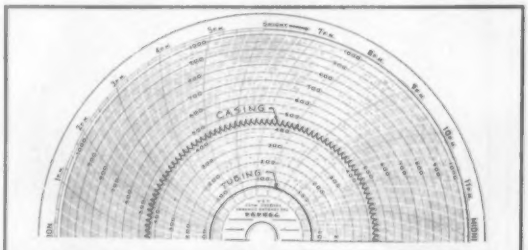
A simple well check will also indicate whether or not tubing leak or a gas-lift-valve leak exists. The tubing pressure is equalized with the casing pressure by means of a bypass or by closing the tubing wing valve. Pressure is then decreased on the casing by bleeding off gas. If the tubing gage indicates a drop in pressure, it is likely that a tubing leak exists. However, if no drop in pressure is noted on the tubing gage it is then indicated that a gas-lift valve is leaking. This test would only be valid if all reverse checks were sealing properly. A leaking valve with a reverse check failing to hold would also behave similar to a tubing leak for this test.

Conclusions

The proper analysis of a gas-lift well may result in savings for the operator by decreasing injection-gas volumes and increasing total oil recovery. All wells should be completely analyzed while seemingly performing satisfactorily. In particular, flowing pressure surveys should be considered. Although a change in valve spacing

TABLE 1

Chart	Wellhead tubing pressure	GOR	Depth to point of injection (ft.)	Tubing press. at point of injection (psi.)	Surface casing pressure required (psi.)
20	50	2,500:1	2,625	500	525
		5,000:1	2,450	425	450
21	100	2,500:1	3,200	750	750
		5,000:1	2,700	535	550
22	200	2,500:1	4,375	1,250	1,190
		5,000:1	3,175	730	730



OPERATION – Intermittent Lift
TROUBLE – Well sanded up.
REMARKS – Well blowing dry gas from deep injection point.

Chart 19

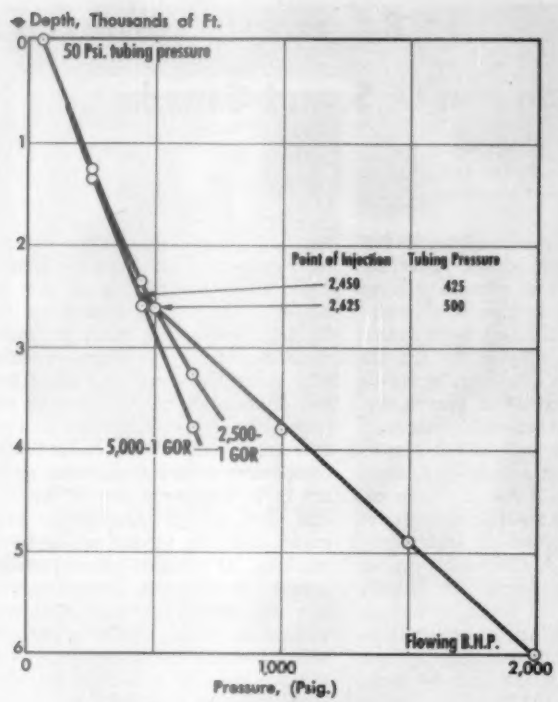


Chart 20

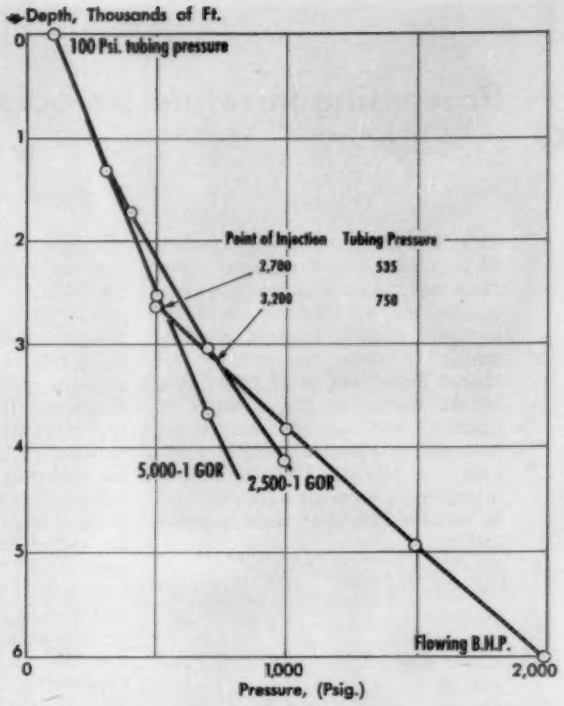


Chart 21

may not be economical at the time of the survey, valuable information will be obtained which can be used if and when the tubing is pulled.

The use of two-pen recording charts cannot be overemphasized. By analyzing these charts, trouble can immediately be detected without making a trip to the well. Many operators determine when correcting adjustments are necessary by merely keeping a daily record of recording charts. Such things as increased back pressure and leaking tubing or valves are immediately detected.

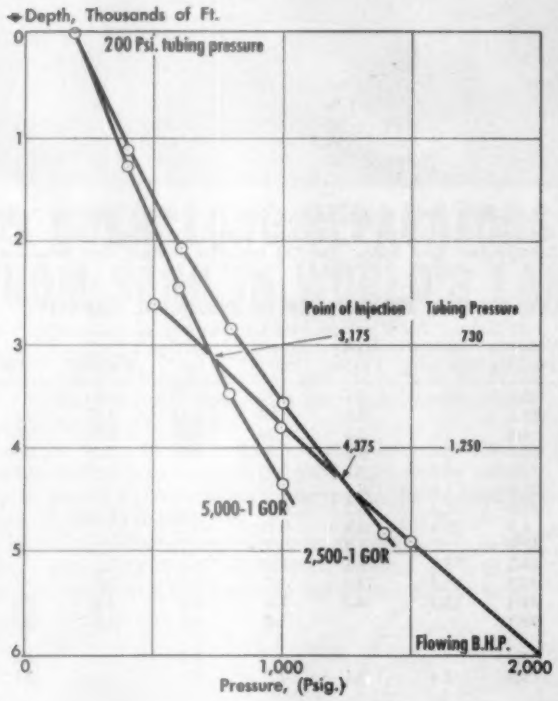


Chart 22

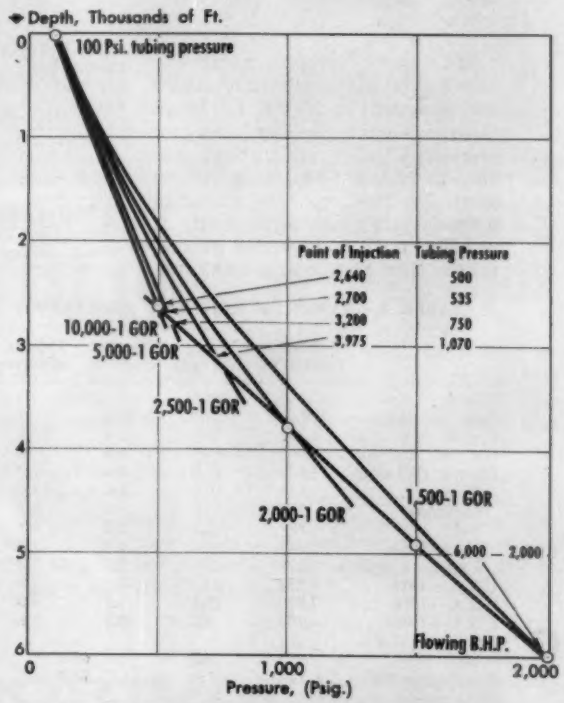


Chart 23

Processing in refineries outside the U. S. and Canada

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

THE TYPES of processing conducted in United States refineries since 1889 was outlined in Process Costimating No. 82 (October 24, 1960, p. 104). Canada requires products similar to those required by the United States, but in all other parts of the world, smaller amounts of gasoline are needed and larger amounts of kerosine, middle distillates, and fuel oil. Thus the following yields of products were produced by western European refiners during 1957:

	Per cent
Gasolines	20
Kerosines	4
Gas or diesel oil	23
Fuel oil	35
Others	18

Whereas during the same year, the production in the U.S.A. was about:

	Per cent
Gasolines	44
Jet fuel	2
Kerosine	4
Distillate fuel	23
Residual fuel	14
Others	13

The types of processing capacity installed in world refineries (1958) are indicated in Table 1. When these capacities are analyzed for complexity using the method outlined in Process Costimating No. 80 (Sept. 26, 1960, p. 216), Canadian refineries are found to be nearly as complex as U. S. refineries whereas the Far East, Middle East, and Latin-American (mainly Caribbean) refineries are relatively simple refineries. Complexity arises primarily from two factors: (1) lubricating-oil manufacture, and (2) high-octane-gasoline production, although the amount of sulfur in the crude oil is also a significant factor. The complexity, approximate installation costs (if built in U. S.), and related factors for refineries throughout the world are indicated in Table 2. Note especially that the installation costs are for the construction of such refineries in the U.S.A. Construction costs throughout the world are usually higher than in the United States especially in areas where industrialization has not occurred. (See Process Costimating Nos. 33 and 34, June 24, and July 8, 1957.)

The economic feasibility of catalytic cracking originally rested more on the reduction of residual fuel oil than on octane number of gasoline. Thus catalytic cracking is not as useful in foreign refineries as in U. S. refineries. In many instances thermal cracking is more suitable. This is not borne out by Table 1 but this discrepancy can possibly be explained by the eagerness of foreign operators (and U. S. construction companies) to install the most modern U. S. equipment and by the fact that most foreign installations were made after the advent of catalytic cracking. If a higher-octane-number gasoline is required, foreign operators can install catalytic reforming without sacrificing yields of fuel oil. Many foreign refineries operate on Middle East or heavy Venezuelan crude oil, and thus there will be an increasing use of hydrotreating processes.

TABLE 2—COMPLEXITY OF WORLD REFINERIES (1958)

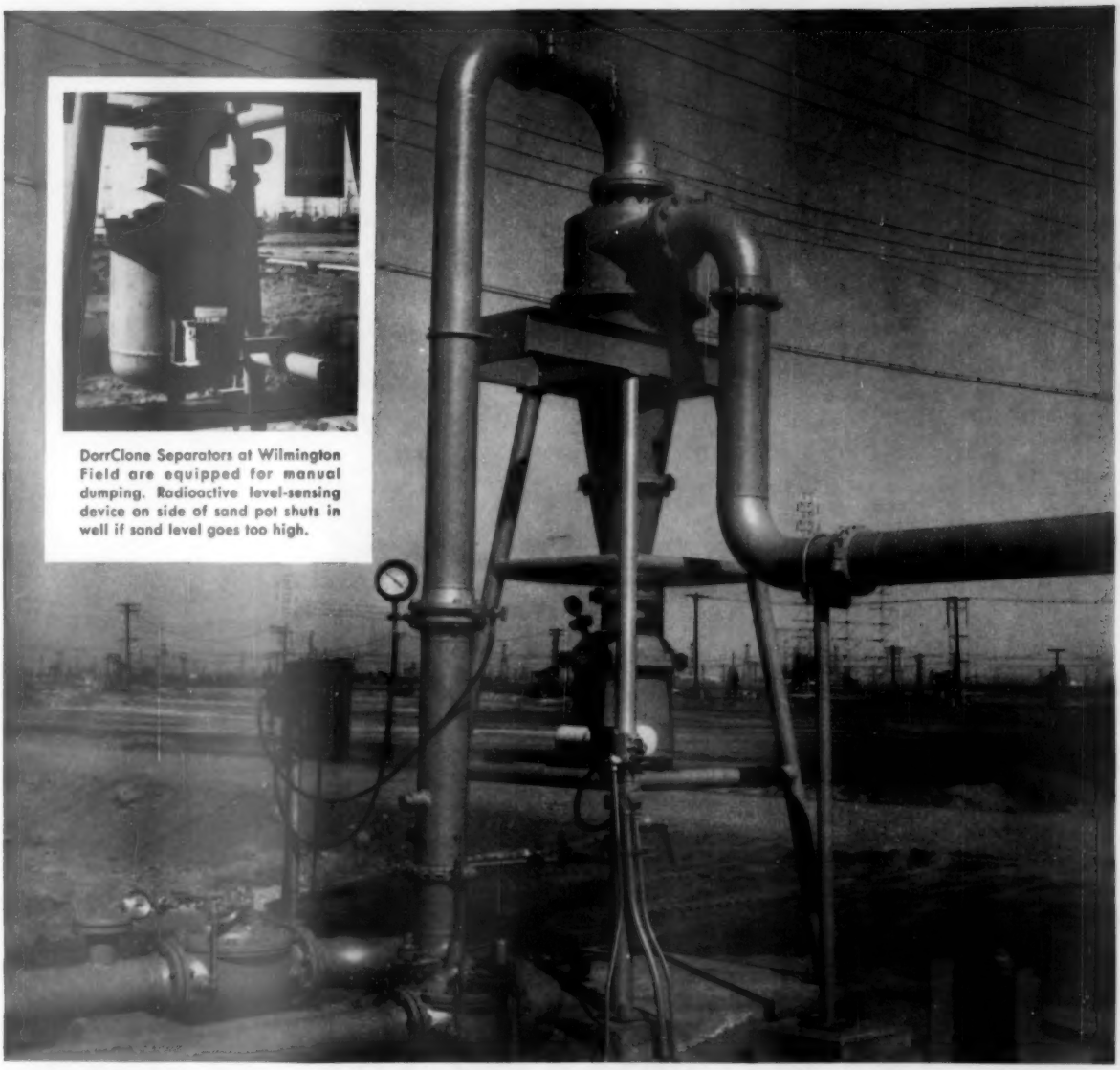
	Crude oil		Res. O.N., regular gasoline†	% Lubes	Complexity	U. S. refinery cost, $ per daily bbl.	
	API*	% S*				1946	1958§
Latin America‡	25	1.60	*80	0.25	3.50	400	855
Middle East	34	1.60	....	0.07	3.40	395	845
Far East	..	....	*81	0.20	2.90	370	790
Europe	..	....	84	1.54	4.68	455	972
Canada	35	0.60	*90	*0.70	6.35	530	1,130
U.S.A.—1958	32	0.63	91.8	1.8	7.63	592	1,270
U.S.A.—1956	33	0.65	89.6	2.0	7.33	579	1,240
U.S.A.—1946	34	0.63	82.0	2.8	6.43	537	1,150

*Approximate or estimate. †Process Costimating No. 74, Cost of Chemicals Outside U.S.A., June 27, 1960, p. 122. ‡Mainly in Caribbean area. §Converted from 1946 by Nelson Refinery Construction Cost Index, The Oil and Gas Journal, first issue each month.

TABLE 1—TYPES OF REFINERY PROCESSING (JANUARY 1958), PERCENTAGE OF CRUDE-OIL CAPACITY

	Crude oil, 1,000 BPSD	Vacuum	Thermal cracking	Thermal reforming	Catalytic cracking	Catalytic reforming	Hydro. treating	Polymerization*	Alkylation*	Asphalt*	Lubes*
Canada	823	34.8	14.5		43.9	15.4	7.1	3.74	0.27	†2.0	†0.7
Latin America	2,644	†3.9	29.6	1.9	12.6	1.1	0.9	0.74	0.42	0.81	0.25
Middle East	1,261	†1.4	23.0	12.5	4.6	3.1	2.3	0.24	0.87	0.91	0.07
Far East and Aust.	1,088	†4.0	5.6	1.8	13.2	4.6	0.5	0.83	0.33	0.21	0.20
Europe (Western)	3,022	†5.0	4.0	7.0	15.8	6.7	2.3	0.93	....	0.69	1.54
France	634	†6.9	2.6	13.5	22.0	3.6	0.1	0.53	....	....	....
Germany	357	†5.7	5.5	6.2	17.0	8.1	13.2	0.31	....	....	....
Italy	581	†2.5	5.2	6.7	8.0	10.4	0.3	0.71	....	....	....
Netherlands	349	†5.2	8.3	5.0	18.9	2.1	3.4	0.27	....	....	....
United Kingdom	639	†6.0	1.3	3.8	19.1	7.5	1.5	1.99	....	....	....
U.S.A.—1958	7,580	29.2	19.5	2.9	43.5	15.8	13.8	1.5	3.2	5.1	1.8
U.S.A.—1956	7,920	26.6	23.1	4.0	41.4	10.3	4.8	1.6	2.8	4.8	2.0
U.S.A.—1946	4,740	9.2	36.7	5.6	19.1	....	....	1.4	1.2	1.8	2.7
Aruba and Curacao—1959	650	†3.7	65.5		15.0	....	....	....	1.5	....	1.0
Venezuela—1959	110	†1.6	13.9		6.4	2.4	2.1	0.3	0.3	....	0.5

*Barrels product rather than feed. †Estimate. Assuming about half as much as would be used in U.S.A.



DorrClone Separators at Wilmington Field are equipped for manual dumping. Radioactive level-sensing device on side of sand pot shuts in well if sand level goes too high.

15 DORRCLONE SEPARATORS PROTECT PUMPING PLANTS FROM SAND IN WORLD'S LARGEST FLOODING OPERATION

■ California's Wilmington Field water flood operation, built and owned by the Long Beach Harbor Department, is being systematically carried out, fault block by fault block. Purpose is to increase oil recoveries, and to check land subsidence in the field.

At the heart of the system are completely automatic plants which take oxygen-free brine from nearby source wells, desand it, treat it and pump it into the oil bearing zones at 850-1250 psig.

DorrClone separators are operating on 15 wells in the field – removing 98% of all material with a specific gravity greater than 2.6. They keep mains and pumps sand-free for continuous operation at full capacity.

Feed water enters the upper chamber of the DorrClone unit tangentially creating a vortex action. Resulting centrifugal force throws the sand particles to the rubber coated walls of the cone where they pass downward to the underflow chamber. Sand-free water moves to the inner spiral of the vortex and is displaced upward and out into the mains.

The photograph demonstrates the simplicity of the installation. Units can be designed to suit practically all well water systems. For full information, write, Dorr-Oliver Incorporated, Stamford, Conn.

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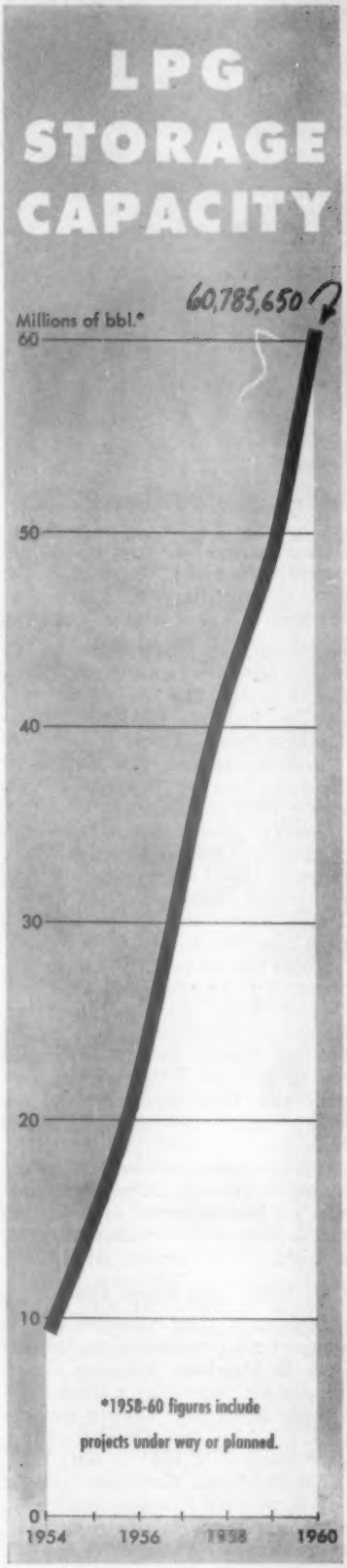
. . . and this is just the beginning!

Wire Rope at Work in the Azalea Field. At the time of the photograph, the BBM Drilling Company was 10,200-ft deep in this well in the Azalea Field, Midland County, Texas. The Bethlehem Wire Rope, 1¼ in. 6 x 19 Seale, Formset Purple Strand, right lay, with IWRC, had been in service for some time. Yet it still was in superb condition, ready to chalk up many additional ton-miles.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. *Export Distributor:* Bethlehem Steel Export Corporation

Wire rope mill depots and distributors from coast to coast stock Bethlehem Rope

BETHLEHEM STEEL



MINED CAVERNS for LPG storage are gaining wide popularity. This big piece of equipment was lowered piecemeal 350 ft. below the surface to scoop out limestone for Continental Oil Co. near Ponca City, Okla. The cavern will hold 300,000 bbl. of propane and is being developed at a cost of about $1,275,000. Completion is scheduled by the contractor, Fenix & Scisson, Inc., next spring.

LPG storage caverns to grow 24%

. . . as new products lines spread and sales continue to climb. More than 20 new projects are in the works. Canada's capacity is growing, too

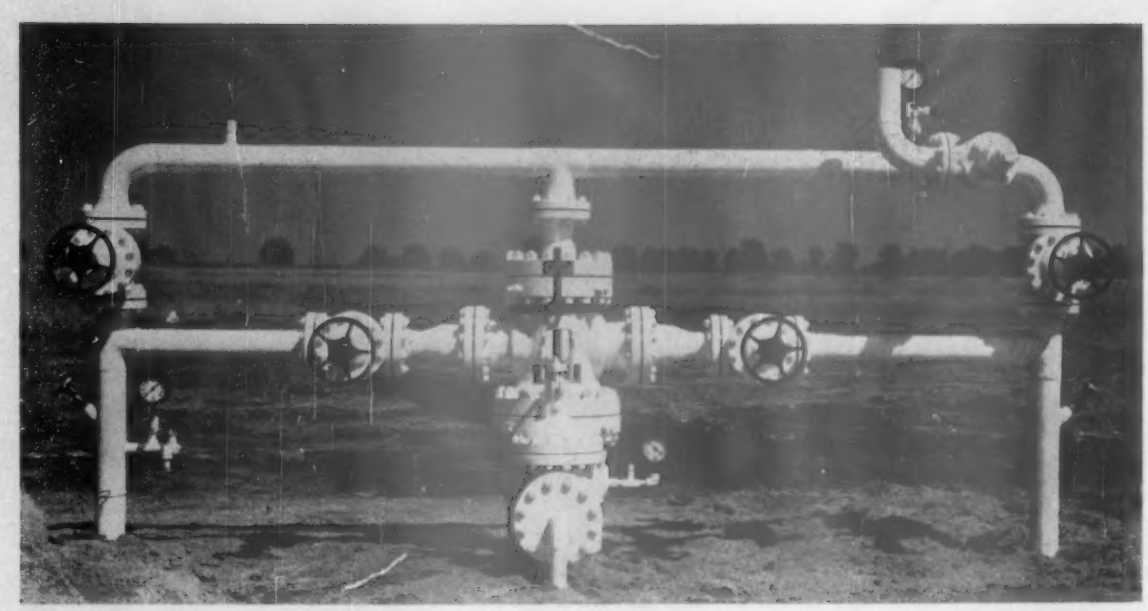
BY ROBERT B. BIZAL
Director, Editorial Research

THE INDUSTRY is digging and leaching out storage caverns at a rapid pace to keep up with the hustling LPG business.

The Oil and Gas Journal's seventh annual survey shows that capacity to store LPG in underground formations in the U. S. will reach 60,785,000 bbl. when projects now underway or planned are completed.

This is nearly 24% more than the 49,024,000-bbl. capacity reported in the Journal's 1959 survey. The new figure is nearly double existing capacity reported in 1957.

New storage space is being created rapidly not only in leached-out salt formations, but also in mined caverns in areas where there are no salt structures.



THE WORLD'S FIRST MAJOR PIPELINE devoted exclusively to LPG includes underground storage in Texas and Kansas. This wellhead is part of the equipment at Mid-America Pipeline Co.'s storage area at McPherson, Kans. Three salt caverns in Kansas will hold 150,000 bbl. of propane. Mid-America's 2,200-mile system from the Southwest to the Upper Midwest will be in use this winter.

The new survey shows more than 20 projects just completed, under way, or planned. Six are mined caves, one is in a gas sand, and the majority are in salt formations.

This spurt in capacity goes hand in hand with two important factors:

... **Giant new pipelines,** exclusively for LPG, are being built for the first time.

... **Domestic LPG demand** continues to grow at a much faster rate than demand for all petroleum products. The future outlook is bright, too.

As the new heating season approached, inventories were at an all-time high. As of October 1, actual LPG and LRG in underground storage was 26,692,000 bbl.

The previous record inventory was October 1, 1959, when actual storage rose to 25,603,000 bbl. before the cold-weather demand began to tug at the stored products.

Pipelines and Storage

The world's first major LPG line has resulted in new storage projects in Kansas and Texas.

Mid-America Pipeline Co.'s new 2,200-mile system from New Mexico to Minnesota and Wisconsin will go into operation this heating season, and so will two related storage areas (OGJ, Oct. 10, p. 123).

One project involves three salt-formation caverns in McPherson County, Kansas, with total ultimate capacity for 150,000 bbl. of propane.

Another involves two salt caverns in Gaines County, Texas, with ultimate capacity for 150,000 bbl. of propane.

A second huge LPG line, which will span the southern states, was announced recently by Transcontinental Gas Pipe Line Corp.

A mined-granite cavern with capacity of 1,000,000 bbl. will be built near Atlanta in conjunction with the new line. Also, a 350,000-bbl. salt-dome storage area will be formed near Eunice, La.

Scheduled for completion by the 1961-62 heating season, the $63-million line will have initial capacity of 60,000 bbl. daily and will stretch from near Houston to Danville, Va. (OGJ, Oct. 3, p. 66). The line will be operated by Transco's subsidiary, Trans-Southern Pipeline Corp.

Both the Mid-America and Trans-Southern lines are designed for exclusive LPG movement.

Another products line, although not exclusively LPG, also brought on a flurry of new LPG storage construction several years ago—Texas Eastern Transmission Corp.'s Little Big Inch from near Houston to Ohio.

Texas Eastern has drilled three salt-dome storage wells in Chambers County, Texas. One well has been washed to completion at 1,000,000 bbl. net capacity, and the washing of the second and third wells is now underway. Total net capacity of the storage area is now about 2,200,000 bbl.

On the northeastern end of the line in Butler County, Ohio, mined caverns are being operated by Cincinnati Gas & Electric Co. and Dayton Power & Light Co. (see storage table).

Salt cavities, mined caverns expanding fast

	Capacity in bbl.* 1959	1960
Salt domes and salt layers	40,707,750	50,595,850
Mined caverns (shale, granite, etc.)	4,459,000	6,464,800
Oil, gas, and water sands	3,725,000	3,725,000
Miscellaneous	132,940	.....
Total	49,024,690	60,785,650

*Including projects under way or planned. The 1960 total doesn't include miscellaneous buried tanks reported in 1959 survey.

Other New Mined Caves

Here is a brief rundown of the status of other mined storage projects:

... **In Maryland,** Baltimore Gas & Electric Co. is building a granite cavern which will have ultimate capacity of 150,000 bbl. Initial storage of propane will start in 1963 or early 1964.

... **In Oklahoma,** Continental Oil Co. will complete a limestone storage facility near Ponca City in April 1961. Propane capacity will be 300,000 bbl.

... **In Nebraska,** Metropolitan Utilities District of Omaha began filling its new shale cavern late this summer. Propane capacity is 178,000 bbl.

... **In Illinois,** Shell Oil Co. was set to complete its second limestone cavern near Wood River late this year. It will hold about 238,000 bbl. of propane. The first cavern at that site, with capacity of about 523,000 bbl., was recently completed for butane storage.

... **In Pennsylvania,** Sun Oil Co. is nearing completion of a 400,000-bbl. propane cavern and a 250,000-bbl. butane cavern at Marcus Hook. Already completed is a 250,000-bbl. butane cavern. All three are in granite.

New Salt Caverns

The most far-reaching event in LPG salt storage this year was the recent agreement in the Sid Richardson patent case.

The agreement by more than 50 principal storage companies to pay $1,500,000 to the Sid Richardson Estate interests ended two Federal Court suits. The Richardson Estate had sought to collect a ⅛-cent royalty on each gallon of product withdrawn from a storage cavern leached out of salt (OGJ, Aug. 8, p. 45).

Most of the LPG industry will be free to store products in salt caverns without paying royalty after the settlement is signed.

According to the Journal's new storage survey, existing and definitely planned capacity in salt formations totals more than 50,595,000 bbl., which is by far the biggest portion of the total capacity (see table on preceding page). Salt storage is attractive in that it is a very cheap way to store LPG.

Here is a summary of some of the new salt-cavern projects:

... **Dakota Salt & Chemical Co.** now has capacity to store 90,000 bbl. of LPG in Williams County, North Dakota, and more space is being added for next year.

... **El Paso Natural Gas Co.** has drilled wells for two new caverns in Lea County, New Mexico. The project will probably be completed in 1961.

... **Humble Oil & Refining Co.,** Esso Standard Division, has announced a sixth cavern in Louisiana. The new one will be used for propane and will have a capacity of 350,000 bbl. on completion July 1961.

... **National Cooperative Refinery Association** is expanding storage space at McPherson, Kans., with 12 new caverns having total capacity of 600,000 bbl. for propane.

... **Phillips Petroleum Co.** will increase salt-dome capacity by nearly 1,500,000 bbl. in Brazoria County, Texas (see table for details). Also, Phillips will add new space in Reeves County.

... **Pure Oil Co.** reported plans for a new salt-dome facility in Jefferson County, Texas, with ultimate room for 250,000 bbl. of propane.

... **Shell Oil Co.** will complete leaching of a 425,000-bbl. butane facility in Ascension Parish, Louisiana, in April 1961. Other salt may be washed later at the same site.

... **Sinclair Oil & Gas Co.** has a two-cavern program under way in Reno County, Kansas. Capacity will be 100,000 bbl. for propane.

... **Suburban Gas** completed Utah's first LPG underground-storage project in October. The salt-bed cavern has ultimate capacity of 100,000 bbl. for propane.

... **Texas Gulf Producing Co.** will complete a salt cavity in Ector County, Texas, by January 1, 1961. Ultimate capacity will be 50,000 bbl. for storing ethane through C_5 mix.

The latest salt-cavern project, just recently announced, ties in with Northern Natural Gas Co.'s plans to build a giant 900 M.M.c.f.d. processing plant at Bushton, Kans. Capacity figures were not included in the storage announcement.

The only new gas-sand project reported to the Journal this year involves caverns for butane, propane, and ethane in Kleberg County, Texas. These will be developed by the Humble Division of Humble Oil & Refining.

Canada's Growing

The 1959 Journal survey showed Canada had total capacity to store 743,000 bbl. This has climbed to 1,190,000 bbl. in 1960.

Alberta Underground Storage Co. completed its third salt cavern last April. The three storages at Hughenden hold 150,000 bbl. each.

At Melville, Sask., capacity is now 180,000 bbl., and Steelman Gas, Ltd., reports this will be increased as the need arises.

More LPG news will probably be made in western Canada before long now that exports of natural gas to the U. S. have the green light. This will probably mean more field-processing plants and more liquids. Several plans are pending for pipelines to move large volumes of liquids (OGJ, July 18, p. 57).

In eastern Canada, Imperial Oil, Ltd., has added more capacity at Sarnia by completing a third cavern. This one holds 100,000 bbl. of liquid ethylene.

Sales Spurt

The LPG portion of natural-gas-liquids production in the U. S. has more than doubled since 1945. At that time it represented about 28% of the total. By 1959 this had climbed to 58%.

Sales of LPG in 1959 rose to more than 211,523,000 bbl., or 19% more than the previous year. The biggest percentage gain was in chemicals and rubber. But the major market is still for household, farm use, and motor fuel.

Sales the first half of 1960 were more than 113,166,000 bbl., or nearly 13% higher than the first half of 1959.

The recent efforts to move methane by ship, plus availability of large supplies overseas, could open the door to important events in this field.

Reprints Available

Additional copies of the Journal's seventh annual LPG underground storage capacity are available at 50 cents each.

Place orders with Reader Service, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

Storage Capacity by States

State—	Capacity in Bbl.*
Alabama	365,000
California	600,000
Georgia	1,000,000
Illinois	1,290,200
Kansas	3,781,000
Kentucky	290,000
Louisiana	5,903,000
Maryland	150,000
Michigan	1,184,000
Mississippi	2,505,700
Montana	60,000
Nebraska	178,000
New Jersey	675,000
New Mexico	916,000
New York	870,000
North Dakota	90,000
Ohio	1,058,600
Oklahoma	633,000
Pennsylvania	900,000
Texas	38,136,150
Utah	100,000
Wisconsin	100,000
Total	60,785,650

*Includes projects under way or planned.

Here's the Journal's

LPG Underground-Storage Survey

. . . in the United States and Canada

Alabama

Company, County and type of storage	Capacity (in bbl.)	Product
Tuloma Gas Products Co.—Sinclair Oil & Gas Co.		
Marengo—Mined chalk	140,000	B-P mix
Marengo—Mined chalk	225,000	Propane

California

Standard Oil Co. of California		
Los Angeles—Water sand	150,000	Propane
Los Angeles—Water sand	150,000	Butane
Los Angeles—Water sand	100,000	Propylene
Sunray Mid-Continent Oil Co.		
Los Angeles—Oil sand*	200,000	Propane

Georgia

Trans-Southern Pipeline Corp. (subsidiary of Transcontinental Gas Pipe Line Corp.)		
Near Atlanta—Mined granite (proposed)	1,000,000	LPG

Illinois

Phillips Petroleum Co.		
Kankakee—Mined shale	260,000	Propane
Shell Oil Co.		
Madison—Mined limestone	523,800	Butane
Madison—Mined limestone (under construction)	238,000	Propane
U. S. Industrial Chemicals Co.		
Douglas—Mined shale	170,000	Propane
Warren Petroleum Corp.		
Kane—Mined shale	46,400	LPG
White—Mined shale	52,000	LPG

Kansas

Cities Service Oil Co.		
Reno—Salt layer (4 caverns)	235,000	Butane
Reno—Salt layer (8 caverns)	570,000	Propane
Mid-America Pipeline Co.		
McPherson—Salt layer (3 caverns)	150,000	Propane
National Cooperative Refinery Association		
McPherson—Salt layer (8 caverns)	400,000	Propane
McPherson—Salt layer (10 caverns)	500,000	Butane
McPherson—Salt layer (12 caverns under construction)	600,000	Propane
Pan American Petroleum Corp.		
Grant—Salt layer (7 caverns)	180,000	LPG
Phillips Petroleum Co.		
Kingman—Salt layer (5 caverns)	316,000	Butane, propane
Sinclair Oil & Gas Co.		
Reno—Salt layer (2 caverns under construction)	100,000	Propane
Skelly Oil Co.		
McPherson—Salt layer	490,000	Propane
Tuloma Gas Products Co.		
Reno—Salt bed	240,000	Propane, butane

Kentucky

Columbia Hydrocarbon Corp.		
Greenup—Mined cavern	210,000	Propane
Greenup—Mined cavern	80,000	Butane

Louisiana

Cities Service Refining Corp.		
Cameron—Salt dome	600,000	Normal butane
Cameron—Salt dome	750,000	Propane
Continental Oil Co.		
Evangeline—Salt dome	130,000	B-P mix
Evangeline—Salt dome	105,000	Propane
Evangeline—Salt dome	100,000	Butane
General Gas Corp.		
Bienville—Salt dome	238,000	Propane
Bienville—Salt dome	100,000	B-P mix
Humble Oil & Refining Co., Esso Standard Division		
Ascension—Salt dome (2 caverns)	500,000	Butane
Ascension—Salt dome	165,000	Isobutane
Ascension—Salt dome	330,000	Propane
Ascension—Salt dome (new well under way)	350,000	Propane
Ascension—Salt dome	475,000	Ethylene
Runnels Gas Products Corp.		
Calcasieu—Salt dome	600,000	Ethylene
Calcasieu—Salt dome	100,000	Propane
Shell Oil Co.		
Ascension—Salt dome (under construction)	425,000	Butane
Trans-Southern Pipeline Corp. (subsidiary of Transcontinental Gas Pipe Line Corp.)		
Near Eunice—Salt dome (proposed)	350,000	LPG
Tuloma Gas Products Co.		
Bienville—Salt dome	80,000	Propane, butane
Warren Petroleum Corp.		
Bienville—Salt dome	350,000	LPG
St. Landry—Salt dome	155,000	Propane

Maryland

Baltimore Gas & Electric Co.		
Baltimore—Mined granite (under construction)	150,000	Propane

Michigan

Cities Service Oil Co.		
Kent—Salt layer (5 caverns)	570,000	Propane
Skelly Oil Co.		
Kent—Salt layer	160,000	Propane
Sun Oil Co.		
Wayne—Salt layer (3 caverns)	266,000	Propane
Wayne—Salt layer (2 caverns)	188,000	Butane

Mississippi

Anchor Petroleum Co.		
Forrest—Salt dome	250,000	Propane
Forrest—Salt dome	250,000	LPG
Forrest—Salt dome	250,000	Butane
General Gas Corp.		
Forrest—Salt dome	35,700	Propane
Skelly Oil Co.		
Forrest—Salt dome	240,000	Propane
Forrest—Salt dome	80,000	Butane
Warren Petroleum Corp.		
Forrest—Salt dome	1,400,000	LPG

Montana

Union Texas Natural Gas Corp.		
Wibaux—Salt layer	60,000	Propane

Nebraska

Metropolitan Utilities District of Omaha		
Douglas—Mined shale	178,000	Propane

New Jersey

Humble Oil & Refining Co., Esso Standard Division		
Union—Mined shale	300,000	Propane
Union—Mined shale	375,000	Butane

LPG Underground-Storage Survey (continued)

New Mexico

Company, County and type of storage	Capacity (in bbl.)	Product
Arrow Gas Co.		
Eddy—Salt layer (3 caverns)	106,000	LPG
Atlantic Refining Co.		
Lea—Salt layer	50,000	Butane
Lea—Salt layer	70,000	Propane
El Paso Natural Gas Co.		
Lea—Salt layer (2 caverns)	92,000	LPG
Lea—Salt layer (2 caverns under construction)	.....	Butane, propane
Skelly Oil Co.		
Lea—Salt layer	120,000	Propane
Lea—Salt layer	80,000	Butane
Warren Petroleum Corp.		
Lea—Salt layer	236,000	Propane
Lea—Salt layer	162,000	Propane

New York

Anchor Petroleum Co.		
Steuben—Salt layer (3 caverns)	450,000	Propane
Steuben—Salt layer	120,000	Butane
Suburban Propane Gas Corp.		
Cortland—Salt layer	300,000	Propane

North Dakota

Dakota Salt & Chemical Co.		
Williams—Salt cavern	90,000	Propane, butane

Ohio

Cincinnati Gas & Electric Co.		
Butler—Mined shale	186,200	Propane
Dayton Power & Light Co.		
Butler—Mined shale	190,900	Propane
Standard Oil Co. (Ohio)		
Allen—Mined shale (2 caverns)	60,000	Propane
Texas Eastern Transmission Corp.		
Butler—Mined shale	621,500	Propane

Oklahoma

Continental Oil Co.		
Kay—Mined limestone (under construction)	300,000	Propane
Humble Oil & Refining Co., Carter Division		
Pontotoc—Abd. oil wells	175,000	LPG
Shell Oil Co.		
Beckham—Salt layer	15,000	Propane
Sinclair Oil & Gas Co.		
Seminole—Mined shale	110,000	Propane
Texaco Inc.		
Beaver—Salt layer	33,000	Propane

Pennsylvania

Sun Oil Co.		
Delaware—Mined granite	250,000	Butane
Delaware—Mined granite (nearing completion)	400,000	Propane
Delaware—Mined granite (nearing completion)	250,000	Butane

Texas

Anchor Petroleum Co.		
Martin—Salt layer (4 caverns)	300,000	Propane
Martin—Salt layer (2 caverns)	140,000	LPG
Cities Service Oil Co.		
Cochran—Salt layer	20,000	Propane
Cochran—Salt layer	14,000	Butane
Gray—Salt layer (2 caverns)	235,000	Propane
Gray—Salt layer	110,000	Butane
Cities Service Production Co.		
Midland—Salt layer	50,000	LPG
Continental Oil Co.		
Reagan—Salt layer	46,000	Propane
Cosden Petroleum Corp.		
Howard—Salt layer	50,000	Alky. feed
Howard—Salt layer	175,000	Nat. gaso.†
Howard—Salt layer	100,000	Propane
Howard—Salt layer	100,000	Butane
Dorchester Corp.		
Carson—Salt layer	80,000	Propane
Carson—Salt layer	35,000	Butane
Dow Chemical Co.		
Brazoria—Salt dome‡	500,000	LPG
El Paso Natural Gas Co.		
Ector—Salt layer (4 caverns)	125,000	LPG
Midland—Salt layer (4 caverns formerly carried under Pecos Company)	250,000	LPG
Reagan—Salt layer (10 caverns)	820,000	LPG
Enterprise Petroleum Gas Co.		
Wood—Salt dome	56,925	Butane
Wood—Salt dome	114,675	Propane
Gulf Oil Corp.		
Howard—Salt layer	103,500	Raw product
Jefferson—Salt dome	510,000	LPG
Humble Oil & Refining Co., Humble Division		
Kleberg—Gas sand (planned)	Unknown	Butane
Kleberg—Gas sand (planned)	Unknown	Propane
Kleberg—Gas sand (planned)	Unknown	Ethane
Waller—Gas sand	500,000	Butane
Waller—Gas sand	1,000,000	Ethane, propane
La Gloria Oil & Gas Co.		
Jim Wells—Sand	75,000	Butane
Jim Wells—Sand	100,000	Propane
Lion Oil Co.		
Scurry—Salt layer (6 wells)	495,000	Propane
Scurry—Salt layer (2 wells)	136,000	Butane
Liquigas Co.		
Freestone—Salt dome	264,000	Propane
Freestone—Salt dome	83,000	B-P mix
Mid-America Pipeline Co.		
Gaines—Salt layer (2 caverns)	150,000	Propane
Mobil Oil Co.		
Liberty—Salt dome	2,700,000	LPG
Liberty—Salt dome	600,000	Ethylene
Pan American Petroleum Corp.		
Andrews—Salt layer (3 caverns)	166,100	Propane
Andrews—Salt layer	50,000	Butane
Ector—Salt layer (2 caverns)	151,300	Propane
Hockley—Salt layer (2 caverns)	163,900	Propane
Hockley—Salt layer (2 caverns)	82,300	Butane
Phillips Petroleum Co.		
Brazoria—Salt dome (2 caverns)	1,748,000	Butane, propane
Brazoria—Salt dome (under construction or planned)	500,000	Ethane
Brazoria—Salt dome (under construction or planned)	500,000	Nat.-gas liquids
Brazoria—Salt dome (2 caverns under construction or planned)	456,000	Ethlyene or ammonia
Ector—Salt layer	250,000	De-ethanized gasoline†
Hutchinson—Salt layer (12 caverns)	3,390,000	Butane, propane
Reeves—Salt layer (under construction or planned)	70,000	Propane
Pure Oil Co.		
Andrews—Salt layer (3 caverns)	309,000	Propane
Jefferson—Salt dome	250,000	Butane
Jefferson—Salt dome (planned)	250,000	Propane
Reef Corp.		
Howard—Salt layer (5 caverns)	253,000	Propane
Howard—Salt layer	36,000	Butane
Shamrock Oil & Gas Corp.		
Moore—Oil sand	1,190,000	B-P mix
Moore—Salt cavity	130,000	Propane
Shell Oil Co.		
Ector—Salt layer	365,000	Butane

Company, County and type of storage	Capacity (in bbl.)	Product
Yoakum—Salt layer (2 caverns)	500,000	Propane
Sid Richardson Gasoline Co.		
Winkler—Salt layer (3 caverns)	386,000	Propane
Winkler—Salt layer (brine well)	92,000	.....
Skelly Oil Co.		
Carson—Salt layer	230,000	Propane
Carson—Salt layer	195,000	Butane
Southern Minerals Corp.		
Nueces—Oil sand	85,000	B-P mix
Standard Oil Co. of Texas		
Scurry—Salt layer (4 caverns)	127,500	Propane
Scurry—Salt layer	26,600	Butane
Sunray Mid-Continent Oil Co.		
Scurry—Salt layer (3 caverns)	97,500	Propane
Scurry—Salt layer	16,850	Butane
Tennessee Oil Refining Co. (formerly Bay Petroleum Co.)		
Chambers—Salt dome (6 caverns)	2,000,000	Butane, propane
Texaco Inc.		
Hardin—Salt layer (4 caverns)	833,000	Propane
Scurry—Salt layer (4 caverns)	117,000	Propane
Texas Butadiene & Chemical Corp.		
Chambers—Salt dome (5 wells)‡	1,700,000	Butane
Texas Eastern Transmission Corp.		
Chambers—Salt dome (2nd and 3rd wells under construction)	2,200,000	Propane
Texas Gulf Producing Co.		
Ector—Salt layer (under construction)	50,000	Nat.-gas liquids§
Tuloma Gas Products Co.		
Fort Bend—Salt dome	300,000	Butane
Union Texas Natural Gas Corp.		
Chambers—Salt dome (3 caverns)	500,000	Butane
Glasscock—Salt layer	150,000	Butane
Harris—Salt dome (2 caverns)	650,000	Butane
Harris—Salt dome	500,000	Propane
Upton—Salt layer (4 caverns)	525,000	Propane
Upton—Salt layer (3 caverns)	375,000	Butane
Wanda Petroleum, Inc.		
Harris—Salt dome (leased facilities)	100,000	LPG
Warren Petroleum Corp.		
Chambers—Salt dome	5,232,000	Nat.-gas liquids
Crane—Salt layer	176,000	Propane
Smith—Salt dome	1,000,000	LPG
Stephens—Mined shale	48,000	LPG
Utah		
Suburban Gas		
Grand—Salt bed	100,000	Propane
Wisconsin		
United Petroleum Gas Co.		
Pierce—Mined and sealed sandstone (under development)	100,000	Propane
TOTAL FOR U. S.¶	**60,785,650**	
CANADA		
Alberta		
Alberta Underground Storage Co.		
Hughenden—Salt formation (3 caverns)	450,000	Propane, butanes
Ontario		
Imperial Oil, Ltd.		
Sarnia—Salt layer	80,000	LPG
Sarnia—Salt layer	80,000	Butane
Sarnia—Salt layer	100,000	Ethylene
Sun Oil Co.		
Sarnia—Salt layer (3 caverns)	300,000	Butane
Saskatchewan		
Steelman Gas, Ltd.		
Melville—Salt layer (2 wells)	180,000	Propane
TOTAL FOR CANADA	**1,190,000**	

*Combination storage and miscible-phase displacement. †Not included in total. ‡As reported in 1959 survey. §Ethane through C_5 mix. ¶Includes capacity under construction or planned.

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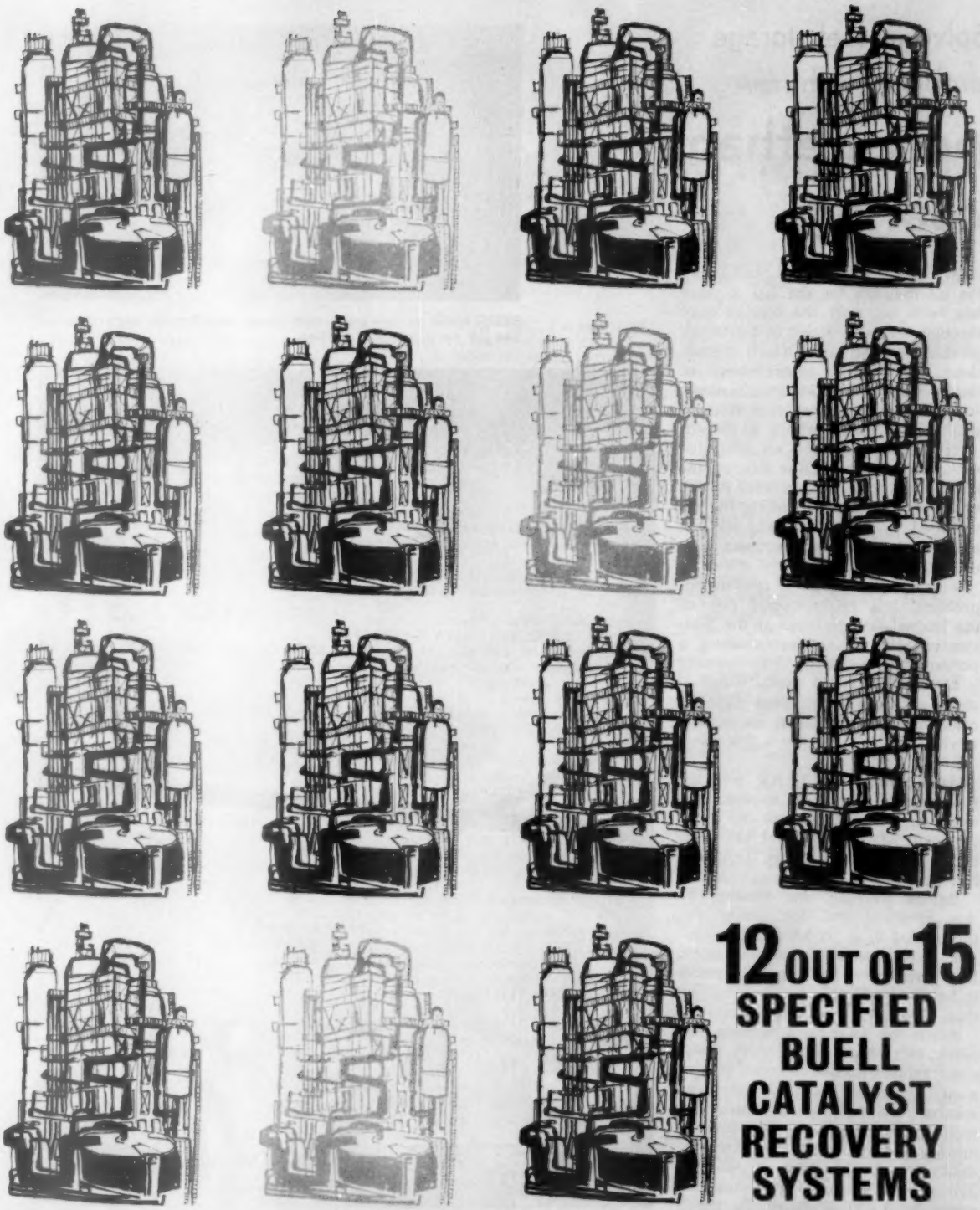

12 OUT OF 15 SPECIFIED BUELL CATALYST RECOVERY SYSTEMS

Of all the fluid cat crackers engineered in the United States since January 1959, 80% have incorporated Buell cyclone systems for catalyst recovery. To meet the most stringent codes for air pollution control Buell precipitators are frequently specified. Refineries large and small have learned from operating experience to count on the dependability and top efficiency of Buell equipment. Buell Engineering Company, Incorporated, Department 61-J, 123 William Street, New York 38, New York. Northern Blower Division, 6405 Barberton Avenue, Cleveland, Ohio. • Electric Precipitators • Cyclones • Bag Collectors • Combination Systems • Classifiers • Fans

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Solve jet-fuel storage problems with new

polyurethane coating

RESISTANCE to corrosion and lower application costs dictated use of polyurethane coating.

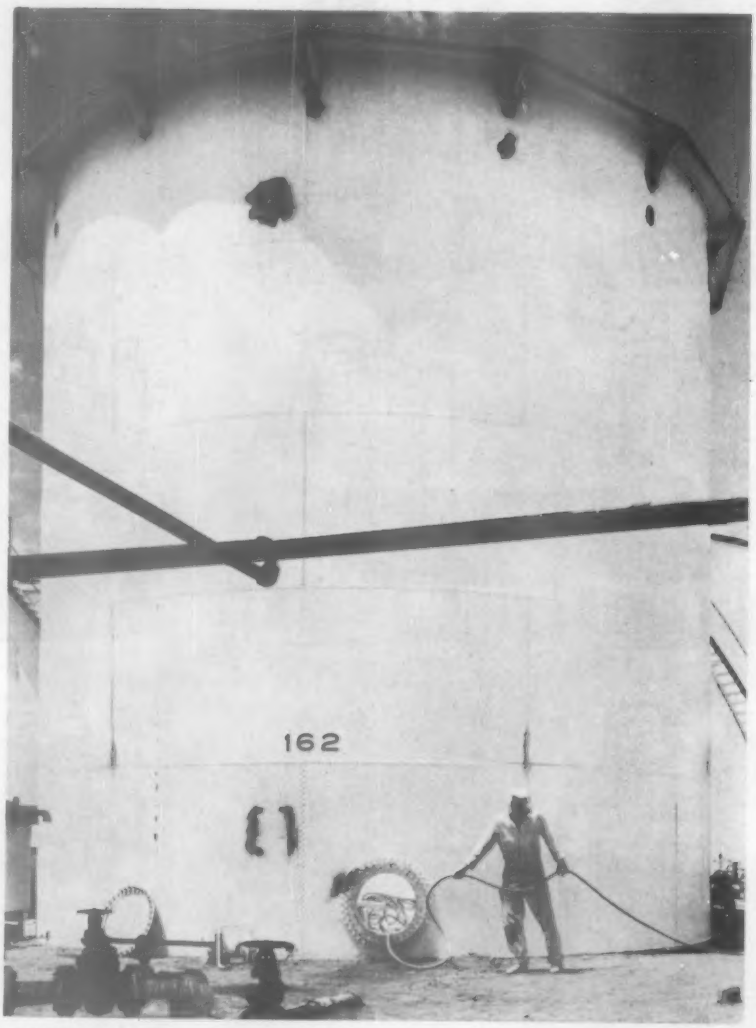
A SERIOUS PROBLEM confronting the oil industry for the last 8 years has been not only the loss of steel through corrosive action of petroleum products on the tanks which contain them, but also rust contamination of the fuel itself. The industry is eager for a solution because rust contamination can occur within 6 months after fuel is placed in an untreated tank, and obviously the life of the tank is limited. Also, official rulings this past year aim at ending the established practice of storing jet fuel and aviation gasoline in tanks with uncoated interiors.

Richfield Oil Corp., to combat this problem, has reconditioned one of the jet-fuel storage tanks at the Watson refinery in California using a polyurethane coating. This coating is expected to last 5 years, which is about a year longer than the uncoated tank would last in similar service.

Application. The tank was the floating-roof type, of riveted construction, 30 ft. high and 30 ft. in diameter, 25 years old, and had never been coated inside. Only light oils had been stored in it.

Before painting, the floating lid was removed and the inside was shotblasted to a "commercial" standard; "white metal" is not necessary. Red garnet or a rock-wool derivative is better suited for the cleaning job than sand because dust is a factor.

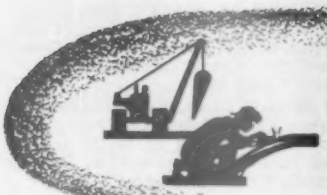
After the interior surface was ready, two painters using spray equipment applied a coat of green primer, a coat of white, a coat of gray, and another coat of white. The intermediate coat of gray provides a visual means of determining accurately the thickness of each coat. A total of 220 gal. of material was needed to cover the 6,200 sq. ft. of the tank's inner surface with a 6-mil coat. The full job took 7 working days.



POLYURETHANE COATING was applied to inside of this 30-ft. by 30-ft. jet fuel storage tank in only seven working days.

Formulation. Polyurethane coatings are produced by combining a polyisocyanate with certain hydroxyl-bearing resins in a solvent system. To mix the coating, one part resin-pigment component was added to one part hardener component, the mixture allowed to stand for 15 minutes, and then applied. Pot life of this mixture is 6 hours at 70° F. and 50% relative humidity. Besides the spray mixture, known as type A, there is a type B for brushing application.

The material used at the Watson refinery was manufactured by Magna Coatings & Chemical Corp. and applied by National Marine Coatings, Inc. The case history on this installation was compiled for Mobay Chemical Co.



Monthly Report on PIPELINE CONSTRUCTION

PIPELINE ACTIVITY reported here is compiled from surveys by The Oil and Gas Journal among pipeline companies and construction contractors.

This summary report appears in the last issue of the Journal each month. New construction projects are reported weekly in Pipeline Briefs in the Journal's news section.

Projects are listed in three groups—U. S., Canadian, and Foreign—and according to type of line—crude, products, natural gas, or miscellaneous.

★ The star symbol indicates the first appearance of the project in the Journal's survey.

U. S. Crude Oil Pipelines

BELLE FOURCHE PIPELINE CO., Box 1612, Casper, Wyo.
Project: 103-mile 8-in. line from Fiddler Creek field to Lance Creek, Wyo., and other lines to serve Roset, Miller Creek, and Lone Tree fields.
Status: Approved by Wyoming Public Service Commission.

CAPE PIPE LINE CO. (Sun Oil Co., Cities Service Co., Atlantic Refining Co.), Philadelphia.
Project: Line from lower Delaware Bay to Philadelphia.
Status: Proposed.

CONTINENTAL PIPE LINE CO., Drawer 1267, Ponca City, Okla.
★ Project: 433 miles of 6, 8, and 10-in. from fields near Cut Bank, Mont., and from fields in central Montana, to Byron, Wyo., where the system will connect with other lines to move crude to the Midwest. This includes a 55-mile 6-in. spur from Roundup, which will extend northeast to connect the central Montana fields. It will be called the Glacier Pipe Line System.
Status: Starting construction this winter before weather becomes too severe. Work to be resumed in spring.
Contractor: R. H. Fulton & Co., Lubbock, Tex., has 10-in. line northwest of Billings.
Completion: August 1961.
Project: 21 miles of 8-in. from Grand Isle to Golden Meadow, La.
Completion: December 15, 1960.

EL PASO PRODUCTS PIPELINE CO.
★ Project: 32-mile, 6-in. line from Patrick Draw field in Wyoming's Sweetwater County to connect with Service Pipe Line Co. near Wamsutter.
Status: Proposed.

GILLETTE PIPELINE, INC., and A. W. HARTWIG, INC.
Project: A 102-mile line from Dead Horse Creek field to Casper, Wyo.
Status: Pending Wyoming Public Service Commission approval.

GREAT NORTHERN RAILWAY, St. Paul.
Project: About 64 miles from Lignite field, Burke County, North Dakota, to Minot.
Status: Planned.
Completion: 1961.

GULF REFINING CO., Drawer 2100, Houston 1, Tex.
Project: 23 miles of reroute of 10-in. near Carlyle, Ill.
Completion: December 1960.

INTERNATIONAL OIL PIPELINE CORP., New York.
Project: Would own U. S. section of 1,500-mile, 30-in. line proposed by Mid-Continent Pipe Lines, Ltd., from Edmonton, Alta., to Chicago. (See Canada).
Status: Proposed.

INTERNATIONAL REFINERIES, INC., 227 North Colfax Ave., Minneapolis 5, Minn.
Project: 3½ and 4½-in. gathering lines in Wiley and Bottineau fields, North Dakota.
Status: Approved by state authorities.

MATADOR PIPE LINE CORP., Denver.
Project: 175-mile line from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man.
Status: Pending approval of Canadian National Energy Board.

MID-AMERICA PIPELINE CO., Skelly Building, Tulsa.
Project: 405-mile, 10-in. condensate line from Superior, Wis., to Chicago. It would connect at Superior with the trunk line of Lakehead Pipe Line Co., eastern division of Interprovincial Pipe Line Co. Shipments would be fed into Interprovincial from gathering lines now under consideration in Alberta.
Status: Proposed.

NORTHWESTERN REFINING CO., Box 248, St. Paul Park, Minn.
Project: 4, 6, and 8-in. gathering lines in Glenburn field, Renville and Bottineau counties, North Dakota.
Status: Has state approval.

SERVICE PIPELINE CO., Box 1979, Tulsa 2.
Project: 22½ miles of 2-in. and 6-in. gathering line in Beaver Lodge Devonian pool, Williams County, North Dakota.
Status: Under way.
Contractors: Oil Field Service, Inc., and Basin Pipeline Construction Co., both of Tioga.

TETON PIPE LINE CORP., 1700 Broadway, Denver 2, Colo.
Project: 67 miles of 6 or 8-in. connecting Badger Creek and Dead Horse Creek fields with terminal facilities in Salt Creek field, Wyoming.
Status: Pending Wyoming Public Service Commission approval.

U. S. Products Pipelines

CALNEV PIPE LINE CO. (owned principally by Union Pacific Railroad Co., Union Pacific Building, Omaha, Neb.).
Project: 212 miles of 8-in. and 13 miles of 6-in. from Colton (near Los Angeles) to Las Vegas, Nev. The 225-mile line will carry gasoline, diesel fuel, and jet fuel, serving Victorville and Barstow, Calif., and Nellis Air Force base in Nevada.
Status: Under way.
Contractor: Williams Brothers, Tulsa, Okla.
Completion: March 1, 1961.

MID-AMERICA PIPELINE CO., Skelly Building, Tulsa, Okla.
Project: 2,300-mile LPG system from West Texas-New Mexico area to upper Midwest. Size of pipe 8 and 10-in., with branches 4 to 8-in.
Status: Under way.
Contractor: Williams Brothers Co., Tulsa, is turnkey contractor. Subcontract for 4 to 8-in. line from Artesia, N. M., to Midkiff, Tex., awarded to McVean & Barlow, Odessa, Tex.
Completion: December 1960.

NEW HAVEN PIPELINE, INC., 515 Madison Ave., New York 22, N. Y.
Project: 12-in. line from New Haven to Hartford, Conn., and 10-in. from there to Springfield, Mass., with a 6-in. spur to Westover Air Base at Ludlow, Mass.
Status: Proposed.

SEADRIFT PIPELINE CORP. (subsidiary of Union Carbide Corp., 30 East 42 St., New York 17).
Project: 56 miles of 6-in. from Bay City to Seadrift, Tex.
Status: Under way.
Contractor: Sharman, Allen, Gay & Taylor, Inc., Houston.

SIBON PIPE LINE CO., Houston.
Project: Mississippi River crossing consisting of three 6-in. products lines near White Castle, La.
Status: Under way.
Contractor: Houston Contracting Co.

TRANS-SOUTHERN PIPELINE CORP. (subsidiary of Transcontinental Gas Pipe Line Corp., Box 296, Houston).
Project: 1,080 miles of 4 to 12-in. LPG line from Mont Belvieu, southeast of Houston, to Danville, Va., and 275 miles of 6-in. spurs, including 215 miles from Atlanta to Waycross, Ga., 25 miles from Linden to Demopolis, Ala., and 35 miles from Laurel to Hattiesburg, Miss.
Status: Planned, with target date for start of construction April 1961.
Completion: By November 1, 1961.

WEST SHORE PIPELINE CO. (Stock owned by Pure Oil Co. and Interstate Oil Pipe Line Co., a subsidiary of Standard Oil Co. of New Jersey).
Project: 200-mile line from Chicago to Milwaukee and Green Bay, Wis., with main line possibly 16-in. and laterals 12-in.
Status: Proposed. The line has backing of 10 oil companies.

U. S. Natural Gas Pipelines

ALASKA PIPE LINE CO., Houston, Tex.
Project: 74 miles from Kenai Unit gas field to Anchorage.
Status: Construction suspended until spring 1961.

PIPELINE CONSTRUCTION

Project: Extension of Kenai-Anchorage line to Fairbanks.
Status: Alaska Pipe Line Co. has ordered economic and engineering studies to determine feasibility of such a proposal.

ALGONQUIN GAS TRANSMISSION CO., 25 Faneuil Hall Square, Boston 9, Mass.
Project: 30 miles of line in Massachusetts.
Status: Approved by FPC.

ARKANSAS LOUISIANA GAS CO., Shreveport.
Project: About 58 miles of 2, 3, 4, and 6-in. line in various locations.
Completion: 1960.

ARKANSAS WESTERN GAS CO., Box 405, Fayetteville, Ark.
Project: New lines from Altus, Coal Hill, and Rock Creek fields to the main system.
Status: Approved by Arkansas Public Service Commission.

BORDER GAS TRANSMISSION CORP. (owned by Lehman Brothers, New York investment firm, and Rio Gas Gathering Co., 615 National Bank of Commerce Building, San Antonio 5, Tex.).
Project: Gathering lines in Starr, Zapata, Jim Hogg, Brooks, and Webb counties, Texas.
Status: Proposed.
Project: Gathering lines in Dimmit, Zavala, and La Salle counties, Texas.
Status: Proposed.

COASTAL STATES GAS PRODUCING CO., 200 Petroleum Tower, Corpus Christi, Tex. (Subsidiaries include Lo-Vaca Gathering Co. and South Texas Natural Gas Gathering Co.).
Project: 330 miles of various size pipe from Three Rivers area to southeast Lavaca County, Texas.
Completion: April 1, 1961.

COLORADO INTERSTATE GAS CO., Box 1087, Colorado Springs.
Project: 7 miles of 20-in. in Texas Panhandle.
Status: Pending FPC approval.
Completion: 1960.
Project: 109 miles of 26-in. from Texas Panhandle to southeastern Colorado; 134 miles of 34-in. from there to Pueblo, and 107 miles of 30-in. on to Denver; 155 miles of 34-in. from Green River, Wyo., to Provo, Utah.
Completion: 1960.
Project: 32 miles of 6-in. from Central Colorado to Trinidad.
Completion: 1960.

COLORADO OIL & GAS CORP., Denver.
Project: 402-mile line from Gubik field to Fairbanks, Alaska.
Status: Proposed.

EL PASO NATURAL GAS CO., Box 1492, El Paso, Tex.
Project: 119 miles of 30-in. Permian-San Juan crossover loop.
Status: Pending FPC approval.
Completion: 1961.
Project: 17 miles of 30-in. near Spokane, Wash.
Status: Pending FPC approval.
Completion: Not known.
Project: 34 miles of 20-in. from Puckett tie-in to Goldsmith, Tex.
Status: Pending FPC approval.
Completion: 1961.
Project: 23 miles of 20-in. from Goldsmith to the Eunice-Plains line, and 395 miles of 34-in. from Thistle, Utah, to near Las Vegas, Nev.
Status: Pending FPC approval.
Completion: 1961.
Project: Loop on the San Juan mainline, involving 27½ miles of 34-in.
Status: Pending FPC approval.
Completion: Not known.
Project: About 228 miles of 30-in. from Coquat to Sonora, Tex.
Status: Pending FPC approval.
Completion: Not known.

EQUITABLE GAS CO., 420 Boulevard of the Allies, Pittsburgh, Pa.
Project: 15 miles of 16-in. in Monongalia County, West Virginia, and Greene County, Pennsylvania.
Status: Approved by FPC.
Completion: October 1961.
Project: 6 miles of 20-in. in Greene County, Pennsylvania.
Status: Approved by FPC.
Completion: October 1961.
Project: 17 miles of 20-in. in Greene and Washington counties, Pennsylvania.
Status: Approved by FPC.
Completion: October 1962.

HOUSTON TEXAS GAS & OIL CORP., Box 10400, St. Petersburg 33, Fla.
Project: 235 miles of 2 to 6-in. lateral lines.
Completion: January 1, 1961.

IRON RANGES NATURAL GAS CO., St. Paul.
Project: 79 miles of 10 and 12-in. from Grand Rapids to Hoyt Lake, Minn., and 67 miles of 12-in. from Duluth to Silver Bay, Minn.
Completion: 1960.

LONE STAR GAS CO., 301 South Harwood St., Dallas 1.
★ Project: 52 miles of 18-in. from Springtown, Parker County, Texas, through Parker and Palo Pinto counties to Gordon.
Status: Planned.

LO-VACA GATHERING CO. (see parent company, Coastal States Gas Producing Co.)

MANUFACTURERS LIGHT & HEAT CO., Union Trust Building, Pittsburgh 19, Pa.
Project: 10½ miles of 24-in. Washington-ton and Beaver counties, Pennsylvania.
Status: Planned.
Completion: September 1961.
Project: 7 miles of 4 to 12-in. in the Victoria storage field, Marshall County, W. Va.
Contractor: Felmont Oil Corp.
Completion: March 1961.

MICHIGAN WISCONSIN PIPE LINE CO., 500 Griswold Street, Detroit 26, Mich.
Project: 26 miles of 6 and 8-in. in Wisconsin.
Status: Approved by FPC.

MISSISSIPPI RIVER FUEL CORP., 407 North 8th Street, St. Louis 1, Mo.
Project: 5 miles of 16-in. and 15 miles of 12-in. from Collinsville, Ill., to St. Jacob, Ill.
Status: Pending FPC approval.

MISSISSIPPI RIVER TRANSMISSION CORP. (Mississippi River Fuel Corp.), St. Louis.
Project: 94 miles of 18-in. from Johnsonville, Ill., to the St. Louis area.
Status: Pending FPC approval.

MONTANA POWER CO., Box 1338, Butte, Mont.
Project: 16-in. line from Carway, Alta., to Cut Bank, Mont.
Status: Proposed.

NATURAL GAS PIPELINE CO. OF AMERICA, 122 South Michigan Avenue, Chicago.
★ Project: 17 miles of 8-in. and 10 miles of 6-in. near Rockport, Tex., including a crossing of Copano Bay.
Status: Under way.
Contractor: Houston Contracting Co.
Projects: 153 miles of 36-in. loop of main line between Ford County, Kansas, and Washington County, Iowa, and 188 miles of 24-in. from near Mountain View, Okla., to Ford County, Kansas.
Status: Under way.
Completion: By January 1, 1961.
Project: 371 miles of 30-in. loop of main line between Wharton County, Texas, and Piatt County, Illinois.
Status: Under way.

OLD OCEAN FUEL CO. (subsidiary of Texas Electric Service Co.). Fort Worth.
Project: 364 miles of 12, 16, 20, and 24-in. from Gulf Coast south of Houston to the Fort Worth area.
Status: Under way.
Contractors: H. B. Zachry Co., San Antonio, Tex., and O. R. Burden Construction Corp., Tulsa, Okla.
Completion: December 1960.

PACIFIC GAS & ELECTRIC CO., 245 Market St., San Francisco.
Project: 9 miles of 12-in. from Berenda Creek to Chowchilla, Calif.
Contractor: Company crews.
Completion: 1960.
Project: 8 miles of 16 and 2 miles of 10-in. Fresno reinforcement.
Contractor: Company crews.
Completion: 1960.
Project: 7 miles of 16-in. from Ignacio to Petaluma, Calif.
Contractor: Company crews.
Completion: 1960.
Project: 67 miles of line from Kettleman Hills to Morro Bay, Calif.
Project: 120 miles of 34-in. looping of Topock-Milpitas main line.
Status: Planned. Pending FPC approval.
Completion: 1961.
Project: 11 miles of 20-in. from Pittsburg to Walnut Creek, Calif.
Contractor: Using company crews.
Completion: 1960.
Project: 291 miles of 36-in. from the California-Oregon border to Antioch, Calif. (Part of a 1,400-mile project to move Alberta gas to San Francisco.)
Contractor: H. C. Price Co., Bartlesville, Okla. (Bechtel Corp. San Francisco, is the engineering manager.)
Completion: System will be in use during 1961-62 winter season.

PACIFIC GAS TRANSMISSION CO. (Pacific Gas & Electric Co., San Francisco).
Project: 611 miles of 36-in. from the Canadian border at Eastport, Idaho, to the California border near Klammath Falls, Ore. (Part of a 1,400-mile project to move Alberta gas to San Francisco.)
Contractors: Western Pipe Line, Inc., Austin, Tex., and J. P. Neill & Co., Dallas, have contracts for the 465-mile southern portion. H. C. Price Co., Bartlesville, Okla., has contract for the 146-mile northern portion from Rosalia, Wash., to Eastport, Idaho. (Bechtel Corp., San Francisco, is the engineering manager.)
Completion: The system will be in use during the 1961-62 winter season.

PANHANDLE EASTERN PIPE LINE CO., 1221 Baltimore Avenue, Kansas City, Mo.
Project: 50 miles of 22-in. and 150 miles of 24-in. from Haven, Kans., to Elk City, Okla.
Completion: December 31, 1960.
Project: 300 miles of 30-in., 18 miles of 26-in., 9 miles of 12-in., 29 miles of 8-in., and 40 miles of 6-in. loop.
Completion: December 31, 1960.
Project: 141 miles of 4 to 16-in. gathering line.
Contractor: Hall Construction Co., Liberal, Kans.
Completion: December 31, 1960.

PEOPLES GAS LIGHT & COKE CO., 122 South Michigan Avenue, Chicago 3, Ill.
Project: 29 miles of 36-in. in the Chicago area.
Status: One portion under way.
Completion: 1960-62.

PEOPLES GULF COAST NATURAL GAS

PIPELINE CONSTRUCTION

PIPELINE CO., 122 South Michigan Avenue, Chicago 3, Ill.
Project: 371 miles of 30-in. loop of present system between Texas and Chicago.
Status: Under way.
Contractors: Stanley-Bledsoe Corp., Tulsa; O. R. Burden, Tulsa; H. C. Price Co., Bartlesville, Okla.; River Construction Corp., Fort Worth; Panama-Williams Corp., Houston; and Sharman, Allen, Gay & Taylor, Inc. Houston.
Completion: December 21, 1960.
Projects: 44 miles of 6 and 8-in. laterals in Aransas and Refugio counties, Texas.
Completion: December 21, 1960.

PEOPLES NATURAL GAS CO., Two Gateway Center, Pittsburgh 22, Pa.
Project: 2½ miles of 12-in. near Wall station, Pennsylvania.
Status: Under study.

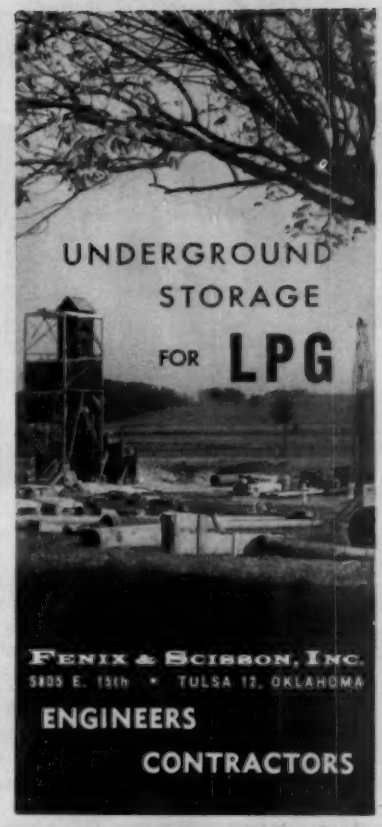
PIONEER NATURAL GAS CO., Amarillo.
Project: 21 miles of 12-in. from Sudan to Muleshoe, Tex.
Status: Pending FPC approval.
Project: 12 miles of 10-in. from Muleshoe, Tex. northward.
Status: Pending FPC approval.

PUBLIC SERVICE CO. OF NORTH CAROLINA, Gastonia, N. C.
Project: About 47 miles of 4, 8, and 10-in. in North Carolina.

RIO GRANDE VALLEY GAS CO., Box 391, Brownsville, Tex.
Project: 60 miles of 12-in. in Hidalgo, Starr, and Jim Hogg counties from Moore field area to Prado field area, replacing and reconditioning existing line.
Status: Planned.
Completion: 1961.
Project: 5 miles of 6-in. from Moore field area to North Monte Christe field, Hidalgo County.
Contractor: Own forces.
Completion: December 1960.
Project: 3½ miles of 12-in. in South Weslaco field area, Hidalgo County.
Contractor: Own forces.
Completion: December 1960.

SAN DIEGO GAS & ELECTRIC CO., Box 1831, San Diego 12, Calif.
Project: 51 miles of 30-in. from the Rainbow meter station to San Diego.
Status: Under way.
Contractor: Stanley-Bledsoe Corp.

SOUTHERN CALIFORNIA GAS CO., Los Angeles.
Project: 13 miles of 34-in. from San Fernando Valley to West Los Angeles.
Completion: 1960.



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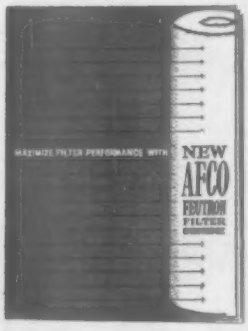

New principles of construction enable the AFCO FEUTRON® filter cartridge to solve liquid and gas filtration problems by superior performance—greater capacity plus uniform results. The differences are controlled density . . . uniform fibers of specified diameter throughout the micron range . . . lower pressure drop . . . and exactly reproducible characteristics for dependable uniformity in the long range. For complete data, write today for your FREE copy of this helpful booklet.

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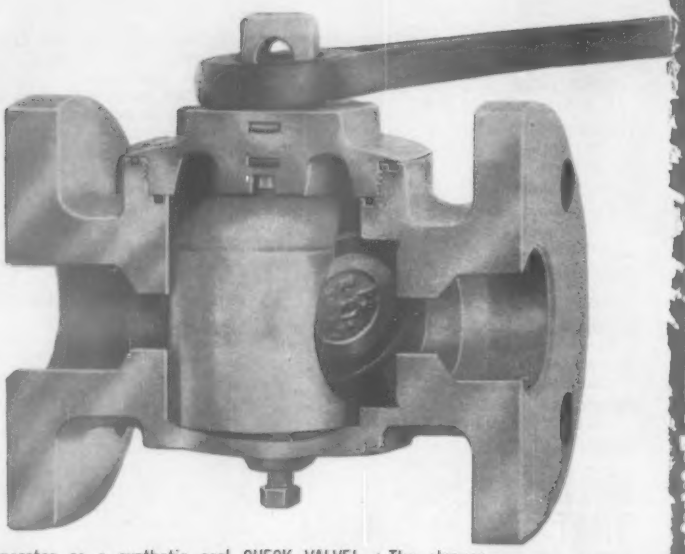

IT'S A CHECK VALVE!

When the Frank Wheatley PLUGAROO is in open position it operates as a synthetic seal CHECK VALVE! / The clapper—hinged vertically on a 20° angle . . . seals with its own weight. On stream—the clapper recesses into the valve body . . . full-opening models permit easy passage of scrapers and spheres. / When in use as a check valve, the "plug feature" provides a fast and convenient emergency shut-off or method of controlling the amount of flow. / The PLUGAROO is completely flexibie . . . it can be mounted horizontally or vertically . . . on its side . . . or upside down. / The PLUGAROO'S applications include gathering lines . . . transmission lines . . . LPG lines . . . product lines . . . meter runs. Anywhere there's piping . . . you can use a PLUGAROO!

CURRENT MODELS: 2" to 10" full or regular opening; steel, semi-steel, aluminum-bronze, stainless steel; series 15 to 90; Teflon, Vitone "A" or synthetic rubber seals. Furnished to all standard API, ASA dimensions and end-connections.

FEATURES: ● Round-hole ● Non-Lubricated ● Vacuum Tight ● Temperatures from 120° F. to 600° F. ● Completely Free of Wearing Parts ● Non-contaminating ● Cylindrical Body ● Less Pressure Drop ● Economical: Series 15—2" Screwed Ends . . . only $10.39.

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FRANK WHEATLEY'S NON-LUBRICATED PLUGAROO! FRANK WHEATLEY'S NON-CONTAMINATING PLUGAROO! FRANK WHEATLEY

PIPELINE CONSTRUCTION

SOUTHERN CALIFORNIA GAS CO., and SOUTHERN COUNTIES GAS CO. OF CALIFORNIA, Los Angeles.
Project: 150-mile line across southern California from the Nevada border to the Los Angeles basin. Line would connect with a proposed El Paso Natural Gas Co. line extending to Rock Springs, Wyo.
Status: Pending approval of State Public Utilities Commission of California.

ST. LAWRENCE GAS CO., Ogdensburg, N. Y.
Project: 75 miles of line from Cornwall, Ont., to Ogdensburg, N. Y.
Status: Approved by FPC.

TENNESSEE GAS PIPELINE CO., a division of Tennessee Gas Transmission Co., Box 2511, Houston 1, Tex.
Project: 21 miles of 16-in. gathering line from Louisiana coast to Block 46 in the Vermilion area.
Status: Pending FPC approval.
Project: 2 miles of 12-in. gathering line from Block 66 to Block 64, East Cameron area, offshore Louisiana.
Status: Pending FPC approval.
Project: 158 miles of 36-in. loop lines at various points between Kinder, La., and Centerville, Tenn.
Status: Approved by FPC.
Project: 50½ miles of 10 to 16-in. gathering lines to serve Delta Block 30, South Timbalier Block 54, Bay Marchand Block 30, and Caillou Island fields offshore Louisiana.
Status: Tentative FPC approval.
Project: 12 miles of 12-in. gathering line from Louisiana coast to Block 17, East Cameron area, offshore Louisiana.
Status: Approved by FPC.
Project: 166 miles of 36 and 30-in. loop lines at various points in Ohio and Pennsylvania.
Status: Pending FPC approval.

TENNESSEE GAS TRANSMISSION CO., Box 2511, Houston.
Project: For proposal to carry Texas gas to California via Mexico, see Foreign Natural Gas listing.

TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston 1.
Project: A new line to take gas from North Louisiana to Kosciusko, Miss., to tie in with the company's main 30-in. line, plus main-line looping.
Status: Proposed.
Project: 85 miles of 24-in. from Tamarack, to Perulack, Pa.
Status: Approved by FPC.
Project: 40 miles of 36-in. from Lambertville, to Linden, N. J.
Status: Approved by FPC.
Project: 23 miles of 20-in. from Eagle, to Chester Junction, Pa.
Status: Approved by FPC.
Project: 53 miles of 30-in. from Perulack, Pa., to Lambertville, N. J.
Contractors: Contracts for the above Texas Eastern projects are held by H. C. Price Co., Bartlesville, Okla.; Western Pipe Line, Inc., Austin, Tex.; and Sharman, Allen, Gay & Taylor, Inc., Houston. Completion in 1960.

TEXAS GAS TRANSMISSION CORP., Box 577, Owensboro, Ky.
★ Projects: 146 miles of new line including 6, 26, and 30-in. loops in Kentucky, Tennessee, Mississippi, Louisiana, and Indiana, and 50 miles of 8 and 16-in. to connect five fields in Terrebonne Parish, Louisiana.
Status: Pending FPC approval.
Project: 29 miles of 12-in. from Slaughters to proposed storage at Greenville, Ky.
Status: Approved by FPC.
Project: 17 miles of 10-in. from its existing 20-in. line near Thibodaux, La., to a proposed meter station in Bayou Chevreuil field.
Status: Approved by FPC.

TRANSCONTINENTAL GAS PIPE LINE CORP., 3100 Travis St., Houston, Tex.
Projects: 62 miles of 30-in. in Texas and 7 miles of 30-in. in Louisiana.
Status: Approved by FPC.
Completion: 1961.
Projects: 23 miles of 36-in. in Louisiana, 39 miles in Mississippi, 88 in Alabama, 83 in Georgia, and 36 miles in South Carolina.
Status: Approved by FPC.
Completion: 1961.
Project: 7 miles of 16-in. in New Jersey.
Status: Pending FPC approval.
Completion: 1961.
Project: 73 miles of 8 to 16-in. offshore Louisiana line.
Status: Under way.
Contractor: Brown & Root, Inc., Houston.
Completion: 1960.
Projects: 1-mile, 16-in. Delaware River crossing in New Jersey and 14 miles of 20-in. in New Jersey and Pennsylvania.
Status: Under way.
Contractor: Fulghum Contracting Corp., Harrisburg, Pa.
Completion: 1960.

TRANSWESTERN PIPELINE CO., 618 First City National Bank Building, Houston 2, Tex.
★ Project: 24 miles of 8-in. near Shamrock, Texas Panhandle.
Status: Temporary FPC approval.

PIPELINE CONSTRUCTION

Project: 250 miles of gathering lines in West Texas and the Anadarko basin.
Status: Temporary FPC approval.

TRUNKLINE GAS CO., Box 1642, Houston.
Projects: About 155 miles of 30-in. loop in Illinois, Kentucky, Tennessee, Mississippi, and Louisiana, plus 17 miles of 24-in. loop from Lowry, La., to south of Iowa, La.
Status: Pending FPC approval.
Project: 41 miles of 26 and 16 miles of 20-in. gathering system from Gordy to Cow Island, La.
Status: Pending FPC approval.

UNITED GAS PIPE LINE CO., Box 1407, Shreveport 92, La.
Project: 59 miles of 36-in. purchase lateral connecting Bastian Bay field, Louisiana.
Status: Pending FPC approval.
Completion: Fall 1961.

WASHINGTON GAS LIGHT CO., 1100 H St., NW, Washington 5, D. C.
★ Project: 16 miles of 24-in. from near Alexandria, Va., to Prince Georges County, Maryland.
Status: Approved by FPC.

U. S. Miscellaneous Pipelines

LINDE CO., a division of Union Carbide Corp., 270 Park Ave., New York 17.
★ Project: 8-mile pipeline to deliver oxygen from new oxygen and nitrogen plant on the Houston Ship Channel to Arco Steel and Diamond Alkali.
Completion: 1961.

TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston 1.
★ Project: 350 miles of 24-in. coal-slurry line to move West Virginia coal to electric companies in Pennsylvania, New York, and New Jersey. (Texas Eastern is working jointly with Consolidated Coal Co., Pittsburgh, Pa.)
Status: Proposed.
Completion: Possibly in 1962.

Canadian Crude Oil Pipelines

ACT OILS, LTD.
Project: A 450-mile line from the Peace River region to tidewater at Kitimat, B. C.
Status: Proposed.

BITUMINOUS OIL PIPELINE CO. (Royalite Oil Co., and Can-Amera Oilsands Development, Ltd.)
Project: A 250-mile line from Athabasca oil sands to Edmonton.
Status: Proposed.

HUDSON'S BAY OIL & GAS CO., LTD., 320 7th Ave. W, Calgary, Alta.
★ Project: 41 miles of 4 and 8-in. condensate line from the Waterton-Castle River area and Pincher Creek field in southwestern Alberta to Carway near the international border. The new line would then connect with Continental Pipe Line's Glacier crude system in Montana and Wyoming.
Status: Pending approval from Alberta government.

MATADOR PIPE LINE CORP., Denver.
Project: 175-mile line from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man.
Status: Proposed. (See U. S.)

MID-CONTINENT PIPE LINES, LTD., Edmonton, Alta.
Project: 1,500 miles of 30-in. from Edmonton to Chicago. U. S. section to be owned by International Oil Pipeline Corp., New York City.
Status: Pending Canadian Board of Transport Commission approval. W. C. Gilman & Co., New York City, has made preliminary study.

NORTHERN PIPE LINE CO., 30 Broad St., New York 4, N. Y.
Project: 153-mile 16-in. line from Regina, Sask., to Clearbrook, Minn.
Status: Pending National Energy Board approval.

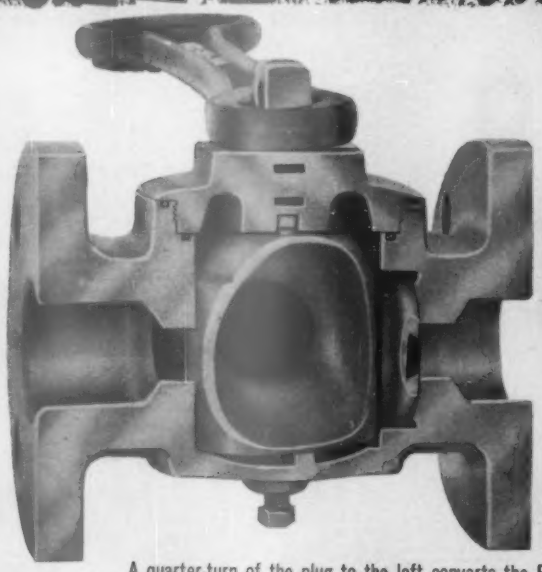
PEMBINA PIPE LINE, LTD., Drayton Valley, Alta.
Project: 70 miles of 3 to 10-in. gathering lines in Pembina field.
Contractor: Mannix Co., Ltd., Calgary.
Completion: December 15, 1960.

RANGELAND PIPE LINE CO., Calgary.
Project: 111-mile line from Cessford field to Calgary.
Status: Pending approval of Alberta government.

TRANS-PRAIRIE PIPELINES, LTD., 12912 125 Ave., Edmonton, Alta.
Project: Expansion of gathering system in British Columbia will include 40 miles of 4-in. from Taylor to Dawson Creek; 30 miles of 6-in. from Boundary Lake to Taylor; 75 miles of 8-in. from Taylor to Milligan Creek, 11 miles of 4-in. from Milligan Creek to West Beaten; and 4 miles of 8-in. near the Taylor station.
Status: Construction under way on first three projects, but much work will be delayed until January when heavy frost will permit equipment movement.
Contractor: Banister Construction Co., Ltd., Edmonton.
Completion: By fall 1961.

ANK WHEATLEY'S NON-LUBRICATED PLUGAROO! FRANK WHEATLEY'S NON-CONTAMINATING PLUGAROO! FRANK WHEATLEY'S

FRANK WHEATLEY'S NON-LUBRICATED PLUGAROO! NON-CONTAMINATING



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A quarter-turn of the plug to the left converts the FRANK WHEATLEY PLUGAROO from a check valve into a non-lubricated PLUG VALVE! / As the plug is turned . . . it forms a cam action against the clapper sealing it bubble-tight against the seat. Tolerances are adequate to prevent scoring and galling of the plug and body. The PLUGAROO absolutely requires no lubrication. / The large, new 8" and 10" series is equipped with completely weather-proof enclosed worm gears for operating the plug. / Why buy two . . . when one will do? Customers save by buying a single PLUGAROO instead of one lubricated plug valve and one check valve. They save 50% of the initial cost . . . untold hours in maintenance and expense of costly lubricants. / As evidence—there are over 20,000 Frank Wheatley combination non-lubricated plug and check valve PLUGAROOS in world-wide use . . . with sales mounting. For complete details write . . .

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PIPELINE CONSTRUCTION

Canadian Products Pipelines

BRITAMOIL PIPE LINE CO., LTD., Box 130, Calgary, Alta.
Project: 126-mile 6-in. line from Pincher Creek to Calgary.
Status: Pending approval of the Alberta Oil and Gas Conservation Board.
Project: 64-mile 8-in. line from Dick Lake to Edmonton, Alta.
Status: Pending approval of the Alberta Oil and Gas Conservation Board.

FOOTHILLS PRODUCTS PIPE LINE LTD., (Pembina Pipe Line Co., Mannix Co., Ltd.), Calgary, Alta.
Project: 1,300 miles of 16-in. from Alberta to Chicago.
Status: Proposed.

HUGHENDEN PIPELINE.
Project: 125 miles from Dick Lake gasoline plant to underground storage in the Hughenden region of eastern Alberta.
Status: Pending approval of Alberta Oil and Gas Conservation Board.

PROVINCIAL PRODUCTS PIPELINES, LTD.
Project: 700 miles of 4 to 12-in. line to pick up propane, butane, and condensates from natural-gas plants in Alberta for delivery to refineries and other plants.
Status: Pending approval of Alberta Oil and Gas Conservation Board.

WESTALTA PRODUCTS PIPELINE, LTD., (Pembina Pipe Line, Ltd., Edmonton, Alta.).
Project: 885-mile 4 to 16-in. gathering system to take natural-gas liquids from plants in Alberta for delivery to proposed trunkline to Great Lakes area.
Status: Pending approval of Alberta Board of Public Utility Commissioners.

Canadian Natural Gas Pipelines

ALBERTA GAS TRUNK LINE CO., LTD., Calgary.
Project: 226 miles of 36-in. and 125 miles of 30-in., plus laterals in southern Alberta including 58 miles of 22-in. and 64 miles of 16-in. (This is part of a 1,400-mile system to move Alberta gas to San Francisco.)
Contractors: Majestic Contractors, Ltd., Edmonton, has 113 miles of 36-in. from Crowsnest Pass to Priddis, 63 miles of 30-in. from Rocky Mountain House to Cynthia, and 38 miles of 22-in. lateral to the Rimbey region. Mannix Co., Ltd., Calgary, has 113 miles of 36-in. from Priddis to Rocky Mountain House. Dutton-Williams Brothers, Ltd., Calgary, has 62 miles of 30-in. from Cynthia to near Whitecourt, Alta., as well as a 20-mile, 22-in. lateral to the Whitecourt area. Piggott Construction, Ltd., Edmonton, has 64 miles of 16-in. lateral from Crowsnest Pass to Carway, Alta., on the U. S. border.
Completion: To be in use during the 1961-62 winter season.
Projects: The following laterals will be built in 1961 to tie in with the above mentioned 1,400-mile project from Alberta to San Francisco: 15 miles of 12-in. to Buck Lake, 23 miles of 22-in. to East Calgary, 15 miles of 16-in. to Carstairs, 4 miles of 8-in. to Sarcee, and 10 miles of 10-in. to Wildcat Hills. Other laterals to be built in the future will connect Kaybob, Berland River, Lovett River, and Stolberg.

ALBERTA NATURAL GAS CO., LTD. (Pacific Gas & Electric Co., San Fran-

PIPELINE CONSTRUCTION

cisco, and Westcoast Transmission, Calgary.)
Project: 108 miles of 36-in. from Crowsnest Pass across southeastern British Columbia to the U. S. border near Eastport, Idaho. (This is part of a 1,400-mile project to move gas from Alberta to San Francisco.)
Contractor: Price-Poole of Canada, Ltd. (Canadian Bechtel, Inc., Toronto, is engineering manager.)
Completion: The system will be in use during the 1961-62 winter season.

CANADIAN INDUSTRIAL GAS, LTD. (formerly Ajax Petroleums, Ltd.), Derrick Building, Calgary, Alta.
Project: 28 miles of 10-in. and 4 miles of 8-in. from Morinville to Westlock Viking Sand field.
Status: Planned.
Completion: By September 1961.

CARTIER GAS CORP. (St. Maurice Gas, Inc. and Consumers' Gas Co., Toronto).
Project: 170 miles from Montreal to Quebec City.
Status: Proposed.

GAS TRUNK LINE OF BRITISH COLUMBIA, LTD., Pacific Bldg., Calgary.
Project: 245-mile, 30-in. extension of Westcoast Transmission system from Taylor, B. C., to Fort Nelson.
Status: Under way.
Completion: December 1961.

MAGNA PIPELINE CO., LTD., Nanaimo, Vancouver Island, B. C.
Project: 25 miles of 4.85-in. double flexible plastic pipe from Huntington, B. C., to Vancouver Island.
Status: Approved by British Columbia Public Utilities Commission. Tentative timetable calls for work to start by spring 1961.

NORTHERN ALBERTA PIPE LINES, LTD., Edmonton, Alta.
Project: 110-mile trunk line, plus gathering system, from Lac La Biche, in McMurray vicinity, to Edmonton.
Status: Pending provincial approval.

QUEBEC GAS TRANSMISSION LINES, INC., 1610 Sherbrooke St. W., Montreal.
Project: 300-mile line from Montreal to Quebec City.
Status: Proposed.

TRANS-CANADA PIPE LINES, LTD., Toronto.
Project: 390 miles of 34-in. main-line loop between Burstall and Winnipeg, Man.
Status: Planned. About 268 miles scheduled for construction in 1961, and 122 miles in 1962.

VAN TOR OIL & EXPLORATION CO., Vancouver, B. C.
Project: Line from British Columbia mainland to Vancouver Island.

WESTCOAST TRANSMISSION CO. LTD., Calgary.
Project: 688-mile, 30-in. loop of British Columbia-Washington line.
Status: Proposed.
Project: (See Alberta Natural Gas Co., Ltd., for joint project).

Foreign Crude Oil Pipelines

ABU DHABIE MARINE AREAS, LTD. (partly owned by British Petroleum Co., Britannic House, Finsbury Circus, London E.C. 2).
Project: 20 miles of 18-in. from offshore Persian Gulf pool to Das Island.
Completion: 1962.

ARAB PIPELINE.
Project: 1,250-mile pipeline from the Persian Gulf to Mediterranean.
Status: Proposed by Saudi Arabian Government and approved by the Arab League's petroleum department.

BARNABO GROUP (Italian interests).
Project: A line from Venice, Italy, to Innsbruck, Austria, which could then be extended to Munich, Germany.

BASRAH PETROLEUM CO., LTD.
Project: 20 miles of 16-in. from Zubair field to Shamiya.
Contractor: Mothercat Co., Ltd., Beirut, Lebanon.
Completion: November 1961.
Project: 65 miles of 30 and 32-in. from Zubair to Fao in southern Iraq.
Contractor: Turriff-Burden, Ltd., Tulsa.
Completion: 1961.

BASRAH PETROLEUM CO., LTD., and **IRAQ PETROLEUM CO., LTD.**, 214 Oxford Circus, London, W.I.
★ Project: 20 miles of dual 32-in. offshore loading terminal at Fao, Iraq.
Contractor: Collins Construction Co., Port Lavaca, Tex.
Completion: Early 1961.

COUNCIL FOR MUTUAL ECONOMIC AID (Comecon).
Project: 2,800-mile system from the Volga-Ural oil fields in Russia to East Europe satellite countries.
Status: Construction under way in Poland, Hungary, and Czechoslovakia. Construction in Russia to start soon. First shipment of crude to reach Bratislava, Czechoslovakia, October 1961. By 1965, Comecon system will be supplying about 300,000 bbl. daily to above-mentioned satellites and East Germany.

CREOLE PETROLEUM CORP., Caracas
Project: About 14 miles of 8 to 24-in gathering line in Lake Maracaibo.

ENI (Italian state oil agency) and **ITALO-SWISS FINANCE CO.**
Project: A 700-mile system from Genoa to Aigle, Switzerland, thence northeast to the German border, where it would split with one branch going to Munich and another branch to the Karlsruhe area. Feeder lines would go to Turin, Milan, and Cremona, Italy.
Status: The trunk line from Genoa to Aigle approved by the Italian Government.

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PIPELINE LEAKS
INSTANTLY

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NOW AVAILABLE IN ALL SIZES.
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PIPELINE CONSTRUCTION

Project: 100 miles of 30-in. from Zelten field to Gulf of Sirte.
Status: To start construction near the end of 1960.
Contractor: Arabian Bechtel Corp.
Completion: Mid-1961.

GERMAN LINE planned by eight German refining and marketing companies (British Petroleum, Esso, Deutsche Erdoel, Shell, Gelsenberg-Benzin, Mobil, Schloven-Chemie, and Wintershall).
Project: 155-mile, 24-in. line to Bavaria from Karlsruhe which is the northern terminus of the big South European Pipeline Co. project from Marseille to Germany.
Status: Planned.

IRANIAN OIL EXPLORATION & PRODUCING CO.
Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bander Mashur line.
Status: Planned.

OASIS OIL CO. OF LIBYA, 539 South Main St., Findlay, Ohio. (Other participants are Esso Sirte and Libyan American Oil Co.).
Project: 86 miles of 30-in. from the Dahra area of Libya to El Sider on the Mediterranean Coast, and 36 miles of 20-in. feeder line from the Mabruk area to the 30-in. line.
Status: Pending approval of the Libyan Petroleum Commission and the provincial government of Tripolitania.

OIL INDIA, LTD. (Burmah Oil Co. and Assam Oil Co., two-thirds, and India Government, one-third).
Project: 720 miles of line in northeast India. This will include 250 miles of 16-in. from Nahorkatiya to Noonmati and 470 miles of 14-in. from Noonmati to Barauni.
Contractors: Mannesmann, a German firm, will lay the 260-mile 16-in. system. Contract for the 460-mile 14-in. line has been awarded to an Italian Government company.
Status: To start November 1960.
Completion: The 16-in. system is scheduled for completion in March 1962.

PETROLEO BRASILEIRO S.A. (Brazil).
Project: 250-mile line from Rio de Janeiro to Belo Horizonte refinery site.
Status: Under consideration.,
Project: 35 miles of 8 to 12-in. pipe from Buracica to Candeia.
Contractor: Techint, Inc., Milan, Italy.
Project: 80 miles of 24-in. to tie in to proposed Caxias refinery near Rio de Janeiro.
Status: Planned.

ROYAL DUTCH-SHELL.
Project: 12-mile line from Gore Bay, Australia, to Royal Dutch-Shell's Clyde refinery.
Status: Planned.
Project: 161 miles 20-in. line from Tandzung field to Balikpapan refinery, Borneo.
Status: Planned.
Contractor: Williams Brothers Overseas, Ltd., Tulsa, and John Brown, Ltd., London.
Completion: January 1, 1962.

SOUTH EUROPEAN PIPELINE CO. (Jersey Standard, Caltex, Shell, British Petroleum, and 12 other firms.)
Project: 419 mile 30-in. line from Lavera, near Marseille, to Strasbourg, with 40-mile extension to Karlsruhe, Germany. This may be extended into lower Batavia with a 155-mile, 22-in. segment.
Status: Construction to get under way by January 1961.
Completion: 1963.

PIPELINE CONSTRUCTION

SYRIAN PIPELINE, Damascus.
Project: 500-mile line from Karsbuk field, Syria, to Mediterranean.
Status: Proposed.

UNION OF SOVIET SOCIALIST REPUBLICS.
Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa and Tuimazy fields in Bashkiria to Irkutsk.
Status: Under way.
(See Council for Mutual Economic Aid for information on new East Europe line.)

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 390 miles of 14-in. from fields in Neuquen Province, Argentina, to Bahia Blanca.
Status: Under way.
Project: 625 miles of 12-in. from Mendoza to San Lorenzo.
Status: Planned.

Foreign Products Pipelines

ARABIAN AMERICAN OIL CO., Dhahran, Saudi Arabia, and 505 Park Avenue, New York.
Project: 37 miles of 8-in. LPG line from Abqaik to 'Ain Dar.
Contractor: Company personnel.
Completion: 1961.

ESTRADA FERROVIARIA SANTOS A JUNDIAL, Sao Paulo, Brazil.
Project: 25 miles of 6-in. ethylene line from Cubatao to Rio Grande.
Contractor: Techint, Inc., Milan, Italy.

NATIONAL IRANIAN OIL CO., Teheran.
Project: 520 miles of 8-in. from Rey to Meshed, Iran.
Status: Under way.
Contractor: Williams Brothers, Tulsa.

NORTH ATLANTIC TREATY ORGANIZATION (Bid details from Bureau of Foreign Commerce, U. S. Department of Commerce, Washington).
Project: 57 miles of 8-in. in Germany to Land Baden-Wuerttemberg air field.
Project: 93 miles of 6-in. in Turkey.

PETROLEOS MEXICANOS.
Project: 291 miles of 8-in. from Torreon to Chihuahua.
Completion: March 1961.

PIPELINES OF PUERTO RICO, San Juan.
Project: 95 miles 8-in. from Penuelas to Catano.
Status: Approved by Puerto Rican Public Service Commission.

SYRIAN PIPELINE.
Project: About 310 miles from Homs to tank farms in the Damascus, Aleppo, and Latakia areas.

UNION OF SOVIET SOCIALIST REPUBLICS.
Project: 2,315 miles of 29-in. Trans-Siberian crude-products line from Ufa and Tuimazy fields in Bashkiria to Irkutsk.
Status: Under way.
Project: 700 miles from Novo-Kuibyshev refinery to Bryansk.
Status: Under way.

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 652 miles of 10-in. from Lujan de Cuyo to Buenos Aires.
Status: Planned.

Foreign Natural Gas Pipelines

BASRAH PETROLEUM CO., LTD., 214 Oxford St., Oxford Circus, London W. 1, England.
Projects: 65 miles of 12 to 16-in. line from Zubair to Fao, Iraq, and 19 miles of 12-in. from Zubair to Rumailah.
Contractor: Mothercat Co., Ltd., Beirut, Lebanon.
Completion: April 1961 for line to Fao and October 1961 for Rumailah line.

GASES NATURALES DE COLOMBIA, S.A. (Owned 50% by Colombian Petroleum Co., which is affiliated with Mobil International and Texaco, and 50% by local interest.)
Project: 140 miles of 10-in. from Cicuco field to the Caribbean port of Barranquilla.
Completion: Late 1961.

INDIA.
Project: India plans to start formal talks with Pakistan soon concerning possibility of importing natural gas from Sui field into India.
Status: Preliminary studies indicate a pipeline to Bombay might be commercially sound.

ISRAEL GOVERNMENT and private interests.
Project: 17-mile, 6-in. line from Zohar field to the Dead Sea.
Completion: February 1961.

MENE GRANDE OIL CO., Caracas.
Project: 19 miles of 12-in. from East Soto to Zapatos.
Completion: 1960.

PAKISTAN INDUSTRIAL DEVELOPMENT CORP.
Project: 1,000-mile system to carry gas from Sui field northward from Multan to Lyallpur, Lahore, Daudkhel, Islamabad, Rawalpindi, and Wah. This would require a loop to an existing 310-mile 16-in. line from the Pakistan petroleum field to Multan.
Status: Under consideration. Technical survey has been ordered.

PAKISTAN PETROLEUM CO.
Project: 145 miles of 8-in. from Sylhet field to Daccq, East Pakistan.
Status: Proposed.

PETROLEOS MEXICANOS.
Project: 200 miles of 14-in. from Mexico City to Salamanca.
Status: Planned.
Completion: September 1961.
Project: 291 miles of 12-in. from Torreon to Chihuahua.
Completion: March 1961.

QATAR GOVERNMENT.
Project: 65 miles of 10-in. from Dukhan to Doha.
Contractor: Mothercat Co., Ltd., Beirut, Lebanon.
Completion: March 1961.

SOC. SICILIANA METANADOTTI (SOSIM). Partners include Edison Power, Italcementi, Fiat Motor, Sicilian SGES Power, Bombrini Parodi Delfino Chemical, and Montecatini.
Project: 560 miles from Hassi R'Mel gas field, Algeria, to Cape Bon, Tunisia, 77 miles across the Sicilian Channel, into northern Italy and beyond.
Status: Engineering studies under way.

SOTHRA.
Project: A 315-mile system from Hassi R'Mel gas field in Algeria to the Mediterranean Coast, including 262 miles of 24-in. trunk from Hassi R'Mel to Relizane and 20-in. from Relizane to Arzew, plus branches to Oran and Algiers.
Status: Under way.
Contractors: Groupement Entrepose-Ste. Parisienne pour l'Industrie Electrique (GREP) has contract for 200 miles from Hassi R'Mel to Tiaret. Socoman has contract for 115 miles from Tiaret to Arzew.
Completion: Spring 1961.

STANDARD-VACUUM OIL CO., New York.
Project: 60 miles of 8-in. from Radja field to Palembang, Sumatra.
Status: Planned.

TEIKOKU OIL CO. and **TOKYO GAS CO.**
Project: These two companies are negotiating a proposed 200-mile, 12-in. system to move gas from Kubiki gas field in Japan.
Status: Proposed.

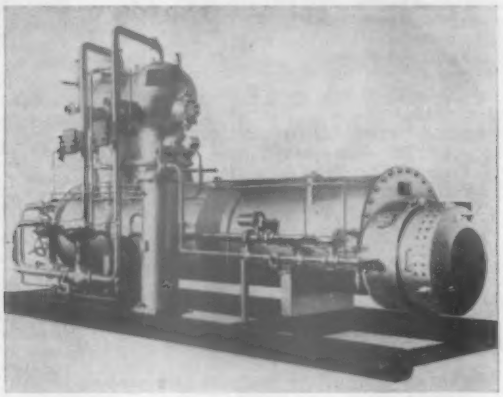
TENNESSEE GAS TRANSMISSION CO., Box 2511, Houston.
Project: 1,100-mile, 34-in. line from Reynosa, near the southern tip of Texas, across Mexico to San Luis Rio Colorado, near the California border.
Status: Agreement signed by Petroleos Mexicanos and Tennessee Gas Transmission.

UNION OF SOVIET SOCIALIST REPUBLICS.
★ Project: New line from gas fields in western Ukraine to the Polish border.
Status: USSR has signed agreement with Poland.
Project: 250-mile line from Ust-Vilyuisk field to the Siberian cities of Yakutsk and Pokrovsk, plus feeder lines to supply villages in the Lena River Valley.
Status: Planned.
Completion: Date not set yet.
Project: Two parallel, 40-in. lines, each over 1,300 miles long, from Gazli, near Bukhara, northward to Sverdlovsk and Chelyabinsk.
Status: Planned.
Project: Line from Samarkand through Tashkent to Chimkent, Dzhambul, Frunze and Alma-Ata near Chinese border.
Completion: Line from Samarkand to Tashkent expected to be finished in 1960. Completion of rest of line expected by 1965.
Project: Line from Berezovo field southward to Sverdlovsk.
Status: Proposed.
Project: 438 miles from Dashava in Carpathian Mountains to Minsk.
Status: Under way.
Completion: 1960.
Project: Line from Minsk northward to Baltic Sea area.
Completion: To Vilnius, Lithuania, in 1961; to Riga, Latvia, in 1962.
Project: Line from Minsk northeast to Leningrad.
Status: Proposed.
Project: 800-mile, 32-in. loop of existing line from Stavropol fields in northern Caucasus to Moscow.
Status: Under way.
Completion: 1960.
Project: 800-mile, 40-in. line from Krasnodar fields north of Caucasus Mountains to Serpukhov, south of Moscow, via Rostov and Lugansk.
Status: Under way.
Project: 310 miles of 32-in. line ringing Moscow at radius of about 50 miles.
Status: Under way.
Completion: 1962.

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 1,050-mile line from Comodoro Rivadavia to Buenos Aires with a spur to Plaza Huincul field in Neuquen province. Line will be 26 in. to the connecting point for the Plaza Huincul link and 30 in. from the connection to Buenos Aires.
Status: Proposed.

This week's SHOWCASE features . . .

New production unit



. . . processes two separate well streams simultaneously. The Free-O-Freez Double Dip unit consists of two spherical separators combined with an indirect-fired heater to form a compact, automatic skid-mounted unit for continuous lease operation in cold weather.

The heater has two separate flow coils and chokes. The separate well streams are heated, choked, and then processed in the individual separators. The three-phase separators are designed so the water section of the separator is submerged in the heater water bath.

The heater has a fuel gas drip and a flash arrestor to prevent flashback. To prevent hydrate formation in the separator, the well stream is preheated in the heater flow coil before the stream is choked. The displacement element for water dump is hung vertically in the separators and completely immersed in the liquid section. Source: **Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 26, Mo.**

Portable handlamp

. . . now available in four models throws a beam over 2,000 ft., according to the maker. The Power House lamp uses a 7½-volt dry-cell battery. A clamp-on mounting plate overlaps the battery top and protects the terminals from dirt and moisture.

The lamp has two bulbs: one for long-distance lighting and the other for occasions when less intensity is desired. Source: **U-C-Lite Mfg. Co., 1050 W. Hubbard, Chicago, 22, Ill.**

●

Glass jet-perforator units

. . . now available carry, respectively, 25 and 35 g. and run in flexible steel strip carriers to provide perforator diameters for use in 4-in. o.d. casing or larger. Shot densities are 1, 2, 3, or 4 holes per ft. The guns may be any length required to perforate single or multiple zones on one run in the well, according to the maker.

An advantage claimed for the expendable glass jet perforator is that it is relatively junk free. When it is fired, the entire unit reportedly disintegrates into a harmless powder of silicone and lime. The steel strip carrier in which the units are run into the well is removed on the electric cable after the gun is fired. The perforators have a pressure rating of 20,000 psi. and a temperature rating of 300° F. Source: **McCullough Tool Co., 5820 S. Alameda, Los Angeles 58, Calif.**

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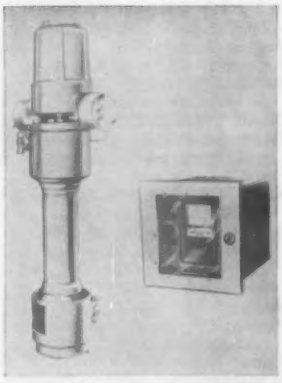

Latest b.s. and w. monitor

. . . comes in two models and is based on the capacitance principle of measurement. The monitor consists of the maker's Type 4450 sensor and transmitter assembly, and either a Type

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to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number: .....

.....

Described in OIL AND GAS JOURNAL · Issue of November 28, 1960

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

705 or a Type 706 diverter controller.

Basically, the sensor measures the dielectric constant of crude oil as it comes from a separator or treator. The transmitter sends an electric signal to the diverting controller. When water is present in the oil, the signal to the diverter will be increased. If the signal exceeds a preset one, the instrument actuates a switch so a diverting valve will route the oil back to the treater or to a storage tank.

The sensor comes with either 2-in. threaded or 4-in. flanged end connections. The Type 705 instrument has a 31-day recorder, and the Type 706 instrument has a meter to indicate per cent b.s. and w. No coaxial cable is required for the equipment. Source: **Fisher Governor Co., Marshalltown, Iowa.**

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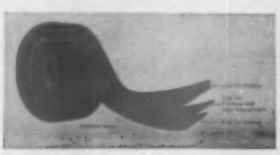


New tape

. . . for pipe coating has been announced, called Tapecoat 20. It is an improved coal-tar protective coating in tape form which is hot-applied with a torch.

The tape consists of a strong fabric saturated with a coal-tar pitch which is said to provide a compatible base for the more pliable coal-tar coating material on the tape.

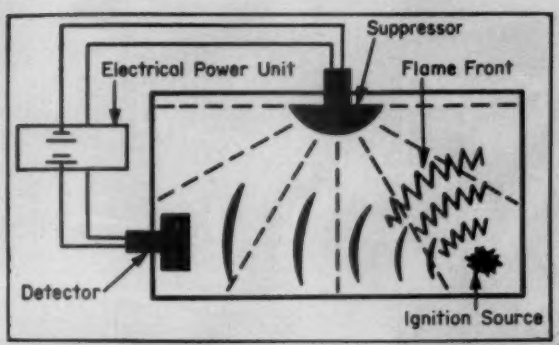
A tough polyester film is imbedded in the side of the tape which is not in contact with the pipe. When wrapping is completed, the film becomes an outer wrap to protect the coating from impact and soil stress. Source: **Tapecoat Co., 1523 Lyons, Evanston, Ill.**

●

Manual valves converted

. . . to automatic operation with a new adapter now for sale that works with present piping and control-valve bodies so lines in overhead runs, walls, floors, and equipment need not be disturbed.

To install the adapter, just remove the valve stem and bonnet of the old valve and screw the adapter into place. Then link the adapter by wiring or hydraulic tubing to an automatic timer or switch. Source: **Febco, Inc., 1993 Blake Ave., Los Angeles 39, Calif.**



Explosion protection

. . . is offered by a new system recently disclosed. According to the maker, the system detects an explosion at the instant of its inception and acts within a fraction of a second to snuff out the blast before it can become destructive.

The system is based upon the principle that a finite lapse of time occurs between the ignition of a blast and the buildup of destructive force. In a few milliseconds after detecting an ignition, the system acts in several ways to prevent a buildup of pressure at the site of the explosion.

It uses a suppressant to contain the explosion, vents pressure to the atmosphere, introduces a suppressant into areas remote from the source of the explosion to prevent secondary explosions or fires, isolates the explosion from other areas, and automatically shuts down a plant or equipment. Source: **Fenwal Inc., Ashland, Mass.**

Improved pump line

. . . offers higher differential pressures and capacity, according to the maker. Improvements in the Coro-Vane line of pumps include modification of the rotor and shaft assemblies so they will float freely and find their own center. Other improvements include a unitized mechanical seal with two external O-rings and a V-type of teflon ring inside. The pump line includes models for truck and transport use and stationary models for filling and liquid transfer. Source: **Corken's Inc., Box 1062, Oklahoma City, Okla.**

●

Valve features interchangeability

. . . of the subassemblies of the body and actuator. The Model 1650 control valve, made in England, is a split-body, single-seated diaphragm type, designed for use where a positioner is not justified. However, if a positioner should be needed, it can be mounted on the top or side of the valve.

Available valve body materials include cast iron, stainless steel, and bronze. The valve is to be mounted in sizes up to 2 in. Source: **Audley Engineering Co. Ltd., Newport, Shropshire, England.**

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to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number: .....

.....

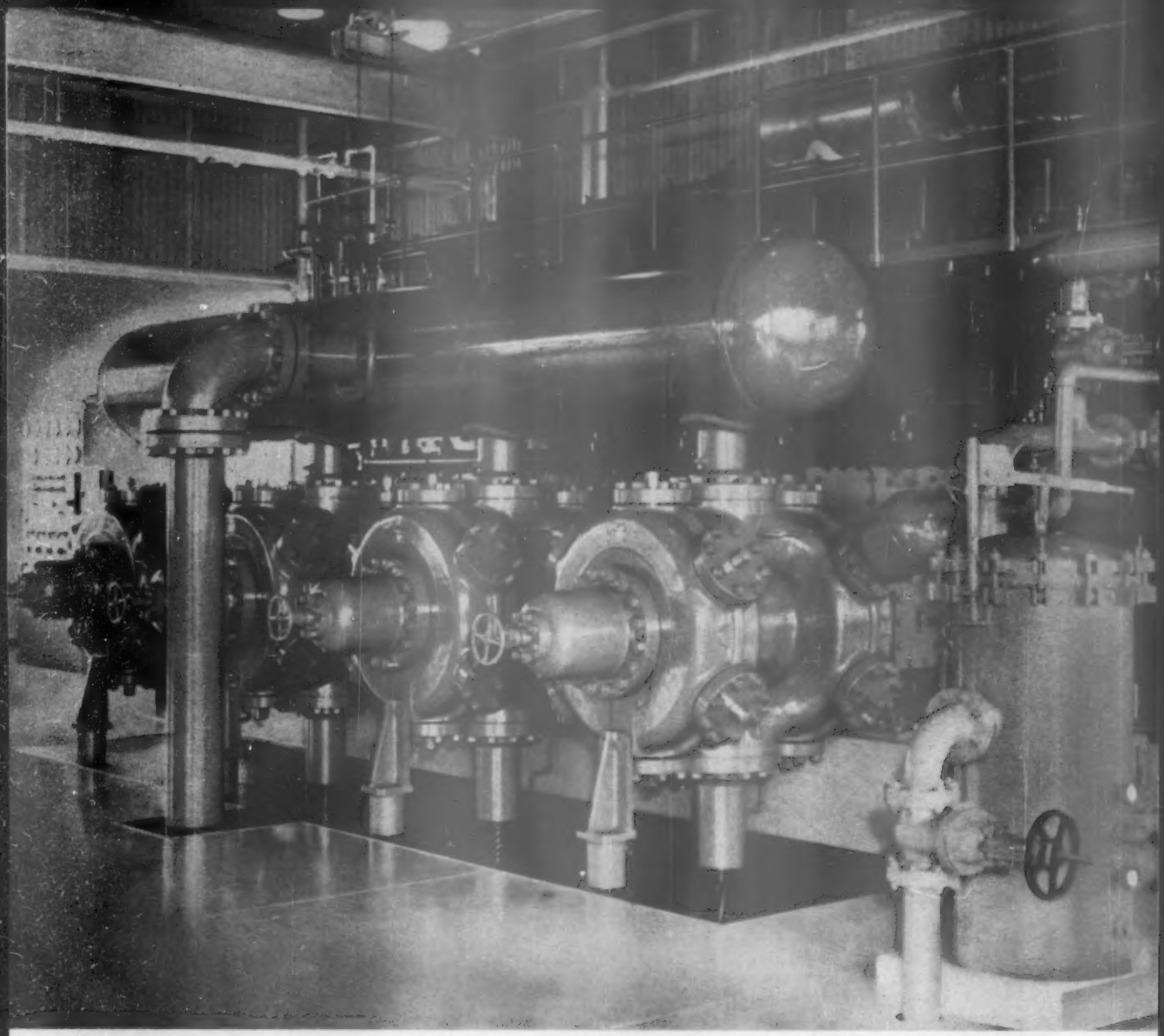
Described in OIL AND GAS JOURNAL - Issue of November 28, 1960

NAME..... TITLE.....

COMPANY.....

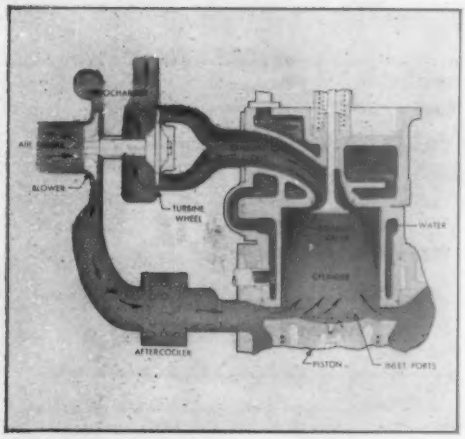
ADDRESS.....

CITY..... STATE.....



At Northern Natural's Clifton Station, this SUTC engine compressor operates

20 HOURS A DAY...FOR 3 STRAIGHT YEARS



Self-sustained turbocharging at any speed and load is possible because of SUTC's exclusive Uniflo scavenging.

Five years ago a remarkable new engine compressor was introduced.

Called the SUTC, this Worthington turbocharged 2-cycle engine compressor was unlike any other. Combustion air enters thru side inlet ports, *but the exhaust is thru overhead valves.* Valve timing can be arranged to give maximum supercharging effect.

On paper, straight-thru or "Uniflo" scavenging has many advantages. The turbocharger operates over the entire speed and load range without help from external sources. Scavenging efficiency is increased and pulsations practically eliminated.

Now came the real test. More than 130,000 hp were installed. Operators praised the SUTC's exceptionally smooth, quiet operation. Operational records confirm the machines reliability. Unit G-2312 is typical. This 8 cylinder, 2000 hp SUTC engine compressor was installed in 1957 in Northern Natural Gas Company's Clifton, Kansas Station. To date, it has logged over 20,000 hours—an average of more than 20 hours a day for 3 straight years. A sister unit installed last year has equalled this performance.

May we send you complete data on this unique engine compressor? Please write to H. C. Barten, Worthington Corporation, P.O. Box 953, Buffalo 5, N.Y.

WORTHINGTON

10-in. turbine-type meter

. . . is available which is comparable to the maker's 16-in. turbine meter recently introduced. Components of the 10-in. Turbo-Meter include a sensitive rotor metering element weighing 4 lb., a viscosity compensator, and a magnetic coupling that is sealed from the line product.

Developed for use with the meter is an operating range chart which shows the flow rate and viscosity conditions under which the 10-in. meter can be used and retain its accuracy and repeatability.

Accuracy of the meter is reported to be higher than ±0.15%. Meter capacity ranges up to 7,000 bbl. per hour. Source: **Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.**

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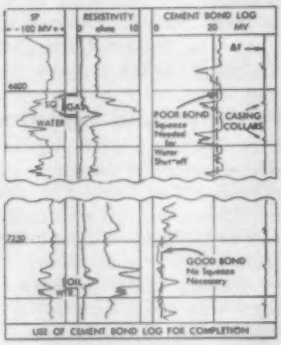

New log checks cement job

. . . to give an indication of the quality of the casing cementing job. The operation of the cement bond log is based on the fact that the energy of a sonic pulse transmitted along a casing diminishes rapidly where the casing is bonded to material, such as hardened cement, which has a sonic velocity much lower than that of the casing.

By pointing to intervals where bonding is incomplete or lacking, the log indicates channeling and gaps in the cement column which require squeezing. The log may be run anytime after the cement sets. In wells being worked over due to water production, the cement-bond log points out probable sources of the water where caused by bad cementing. Source: **Schlumberger Well Surveying Corp., Box 2175, Houston, Tex.**

Pressure hydrophone

. . . developed recently is designed to provide broad-band response and small or no output to motion effects. The Model H-17LF instrument uses a barium titanate crystal with a preamplifier. It will stand 1,500 psi. pressure. In water, it weighs 5½ lb. Source: **Summers & Mills, Inc., 911 W. Commerce, Dallas, Tex.**

●

Pneumatic flow transmitter

. . . lately developed is a bellows type which is said to have unusual temperature stability. The bellows type of differential-pressure meter comes in models for measuring liquid level in closed tanks under pressure or vacuum and for flow or open-tank measurements. The transmitting units come in indicating and nonindicating models with a flapper-nozzle pneumatic circuit, a pilot valve with controlled bleed for stability, and a Ni-Span C rebalancing capsule.

According to the maker, the transmitter provides two-way overload protection and the flowmeter can withstand full static pressure overload in either direction. Source: **Minneapolis-Honeywell Regulator Co., Wayne and Windrim Ave., Philadelphia 44, Pa.**

●

Telephone scrambler

. . . is being produced which is claimed to turn normal conversation into incoherent glibberish to anyone except the person on the other end of the line listening through another scrambler.

The device is a portable, transistorized instrument developed for use with conventional telephone equipment. To use the device, merely fit it over a telephone. It comes in matched pairs. Each unit weighs only 27 oz. Source: **Delcon Corp., 943 Industrial Ave., Palo Alto, Calif.**

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Used on more wells throughout world-wide drilling industry!

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BOX 203—HOUSTON, TEXAS—CApitol 4-9648

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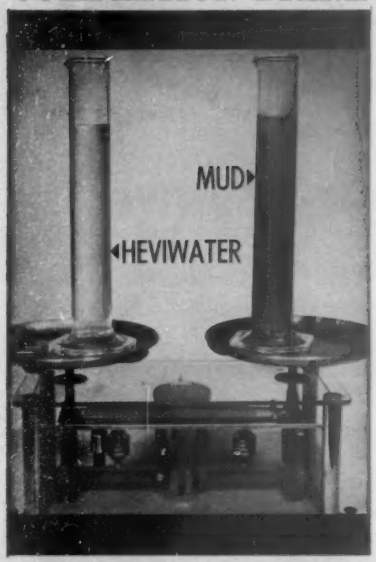

HEVIWATER

Now—for the first time—you can have all the advantages of a clear, heavy completion fluid without the troubles previously associated with this type of material. A new fluid is now available from Dowell. It's Heviwater—a pre-mixed, inhibited packer and completion fluid. Heviwater is available in a variety of weights. It is a stable fluid, with built-in corrosion protection. Heviwater is presently stocked at Berwick, Louisiana, but it can be made available at all Dowell stations. Ask your Dowell man for more information on this brand-new, completion fluid; or write Dowell, Tulsa 1, Oklahoma.

*Dowell Trademark

Products for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

SHOWCASE . . .

New Literature

General products pamphlet

. . . contains 24 pages of items produced by American Chain & Cable's 15 divisions and 8 subsidiaries. Products illustrated include chain, wire rope, push-pull controls, cable assemblies, wire, chain-link fence, welding wire, electric and chain hoists, overhead traveling cranes, valves of bronze, iron, and steel; hardness testers, pressure gages, abrasive cutting machines, malleable iron and steel castings, hydraulic presses, automatic controlling, recording electronic and telemetering instruments, digital data-logging equipment, custom-engineered centers and alarm annunciators, and positioning and metering control systems. Source: **American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport 2, Conn.**

Welding-fittings

. . . called Weldbend, discussed in a 28-page form, free upon request. The publication lists conventional and heavy caps, elbows, flanges, reducers, return bends, tees, and specifications of fittings and flanges. It includes ASA ratings and data tables on each of the products. Source: **Weldbend Tube Products Co., 3601 W. 53rd St., Chicago 32, Ill.**

Water-conditioning data

. . . sheet entitled "Return-Line Corrosion Need Not Be a Problem," discusses how the causes of corrosion can be readily identified and economically corrected. The two-page data sheet contains information on oxygen attack, carbon-dioxide attack, and neutralizing and filming amines. A summary is included. Source: **Betz Laboratories, Inc., Gillingham and Worth Sts., Philadelphia 24, Pa.**

Mechanical-shaft seals

. . . are outlined in a new four-page brochure which includes specifications, data, and illustrations of the seals for rotating shafts of industrial equipment. Authentic installation pictures show the various seal models in use. A chart gives complete shaft-seal size range. Source: **Syntron Co., 1389 Lexington Ave., Homer City, Pa.**

Fluid-bed phthalic process

. . . is discussed in a new four-page brochure which offers a process flowsheet, photos, and information on temperature control, potential yield, product purity, air requirements, and operating and maintenance costs. A typical analysis of product from a recently completed fluid-bed phthalic plant is included: Source: **Badger Mfg. Co., 230 Bent St., Cambridge 41, Mass.**

10,000-hp. compressors

. . . with natural-force balance contain cylinder designs for maximum working pressures from vacuum to 15,000 psi., as described in four-page Brochure 99. It also describes En-Tronic controls which can make the LM compressor into a completely automatic unit which starts itself, shuts itself down, or operates fully unloaded. The brochure contains a cutaway model of the entire unit showing internal mechanisms, a page of charts and diagrams, as well as complete specification tables. Source: **Cooper-Bessemer Corp., Box 751, Mount Vernon, Ohio.**

Corrosion data charts

. . . show corrosive effects of almost 400 different materials on 16 types of metals. Technical Service Bulletin 101 contains charts which indicate the corrosion resistance of the metals to various concentrations of more than 250 chemical salts and acids, as well as more than 100 other common materials. Source: **Nooter Corp., 1400 S. Third St., St. Louis 66, Mo.**

Heavy-duty fluid agitators

. . . are spotlighted in a 16-page publication just issued. Available in sizes ranging from 1/6 to 3 hp., both direct and gear driven, the agitators operate from 420 to 1,750 r.p.m. The bulletin gives photographs, specifications, and cutaway drawings. Source: **Desco Engineering Corp., 214 S. Bemiston Ave., St. Louis, Mo.**

Oil-well-cement slurry

. . . design is described in a newly published 60-page technical bulletin which compares commonly used cement slurries on the basis of weight, volume, cost, thickening time, and strength. The publication, divided into four parts, gives information on portland cement, control of slurry properties, use of admixes, and design of slurries. A glossary is included. Source: **BJ Service, Inc., 6505 Paramount Blvd., Long Beach, Calif.**

Generator brochure

. . . describes and illustrates the new Amesteam generator models, ranging from 20 to 600 hp. Brochure AA-2760 gives an analysis of boiler design factors such as heating surface per horsepower and number of passes. Source: **Ames Iron Works, Inc., Oswego, N. Y.**

▶▶▶ Equipment Men Notes

Universal Oil Products Co. buys

... Catalytic Combustion Corp., Detroit, for UOP stock valued at about $500,000.

Universal, with headquarters in Des Plaines, Ill., is a petroleum and chemical research and process-development company. Catalytic Combustion specializes in the manufacture and sale of catalytic oxidation equipment for industrial heating applications and for elimination of industrial sources of air pollution.

Roy R. Bush is elected

... a sales vice president of Rockwell Mfg. Co.'s Meter and Valve Division with headquarters in Pittsburgh. He joined Rockwell in 1934. Since then Bush has served as Tulsa district manager, assistant product manager for valve sales, and since 1954, midwestern regional manager.

De Laval Steam Turbine sets up

... two independent operating divisions, separating its larger custom-made products from its smaller standardized products.

The Machinery Division will design and manufacture steam turbines, compressors, centrifugal pumps, and other large products usually made to individual customer specifications. The Power Auxiliaries Division will initially include foundry products and De Laval IMO pumps, and will act as a subcontractor to the Machinery Division for certain components for which its manufacturing facilities are better suited.

De Laval also announced the transfer of its Delroyd worm-gear business to De Laval-Holroyd, Inc., Trenton, N. J., an affiliate which it jointly owns with John Holroyd & Co., Ltd., Milnrow, Lancashire, England.

Willis Oil Tool Co. moves

... into newly constructed plant and office facilities in Long Beach, Calif. Occupying a two-acre site, the plant-office complex covers 15,000 sq. ft. which provide ample room for research, drafting, prototype development, production, and expanded test facilities.

The plant production area itself covers over 12,000 sq. ft. and includes space for engine and turret lathes, milling machines, grinders, drill presses, and welding areas. Future expansion can be accomplished within the existing building group.

Daniel Orifice Fitting Co. names

... William B. Wickersham & Co. as executive sales representative in New England. Wickersham will handle sales and service of Daniel products for flow measurement in Maine, New Hampshire, Vermont, Connecticut, Rhode Island, and Massachusetts, except for Berkshire County. Headquarters for the Wickersham firm is in West Newton, Mass., a Boston suburb.

Gorman-Rupp Co. announces

... the appointment of J. Kenneth Sloan as a district representative covering a five-state midwestern area, according to James C. Gorman, sales manager. Sloan takes over the former territory of William S. Miller, who has become sales manager of Gorman-Rupp of Canada, Ltd., St. Thomas, Ontario, Canada.

Sloan, with more than 15 years experience in handling pumps, most recently was sales manager of Wagener Pump Division, Canton Stoker Corp., Canton, Ohio.

Lone Star Steel Co. announces

... two changes in its sales organization. A. P. (Phil) Clarke has been transferred from manager of oil-country goods sales to manager of the standard-pipe sales department. Succeeding Clarke as head of the oil-country goods department is Joe S. Shepherd, sales engineer who has had prior service in each of Lone Star's sales departments.

DISPLAY BOARD which he used on a recent sales trip through the South and East is being inspected by Charles R. Carmichael, sales manager of Amot Controls Corp., Richmond, Calif. The board is set up so that various units are operative and show actual functions with controls in use.

TRETOLITE'S NEW OFFICES and manufacturing plant at Brea, Calif., are located on a 23-acre site which includes an administration building, three laboratory buildings, and a complete, automated chemical manufacturing plant. The California division was formerly located in Los Angeles.

Smith Tool Co. is made division

D. E. Graham

... of the newly created Smith Industries International, Inc., formed as a result of a management policy of diversification and expansion. Donald E. Graham is president and Robert L. Flynne is vice president—finance. H. C. Smith, founder of the original H. C. Smith Oil Tool Co., is chairman of the board.

Smith Tool Co. was originally established in 1936 as H. C. Smith Oil Tool Co., and acquired its present name in 1959 when company stock was placed on the open market. As a division of Smith Industries, Smith Tool Co. is now headed by Kenneth H. Swart, president, and Arthur S. Marshall, vice president—sales. Other divisions of Smith Industries include Smith Dynamics, Bufnel Co., Smith Forge Co., and Barrenas de Mexico.

Harry H. Bauer is appointed

... midwestern regional sales manager for the Scientific & Process Instruments Division of Beckman Instruments, Inc., according to Robert A. Piper, midwestern regional manager. Bauer has been a product line manager in Beckman's Fullerton, Calif., office since July 1959.

Bauer has been with the firm since 1953, serving as a field sales engineer with Arnold O. Beckman Co. in Cleveland and Pittsburgh from 1953 until 1957, at which time he became proc-

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ess sales engineer in the Pittsburgh area for the division. Prior to joining Beckman, he was a process engineer with Standard Oil Co. of Ohio.

Catalyst company is formed

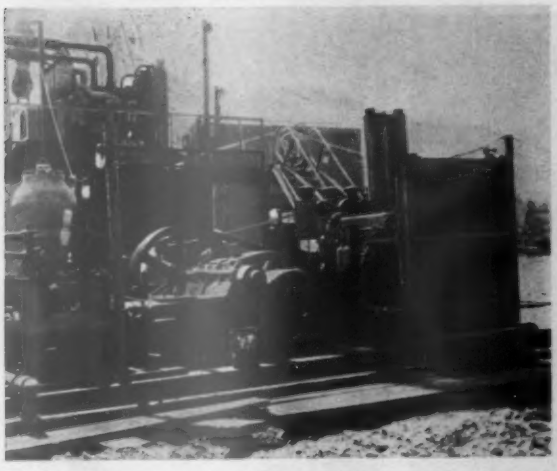
. . . in Germany by Houdry Process Corp., of Philadelphia, and Chemische Werke Huels, of Marl, West Germany. The equally owned company will develop, manufacture, and sell each firm's line of catalysts. The new company—Katalysatorenwerke Houdry-Huels G.m.b.H., will be located in Marl.

Houdry, with a catalyst manufacturing plant in Paulsboro, N. J., and a research and development laboratory in Linwood, Pa., is a licensor of processes and manufacturer of catalysts for the petroleum, chemical, and petrochemical industries.

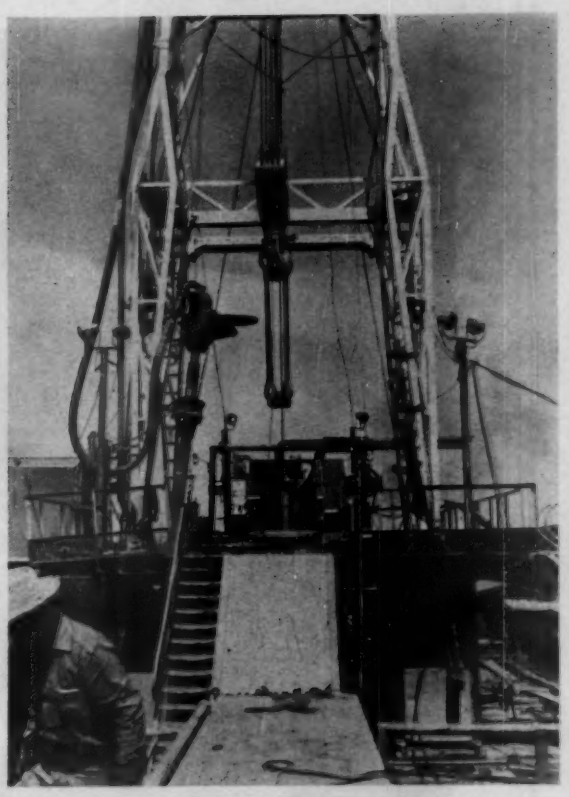
Warren Engle named manager

. . . of the southeastern district of Leschen Wire Rope Division, H. K. Porter Co., Inc. He was formerly a sales representative for Wickwire Spencer Division of Colorado Fuel & Iron Co., and has been in public relations specializing in financial legislation for the past 6 years. Engle will make his headquarters in Atlanta.

SIGNALING DEVICE called Teledrift, used in drilling operations, is the subject of a new two-story-high exhibit recently installed in the Borg-Warner Exhibition Hall in the Borg-Warner Building, Chicago. The display was erected in connection with the annual API meeting held recently in Chicago. Teledrift is produced by Borg-Warner's Byron Jackson Division. The signaling device is installed in the drill-pipe string to furnish surface reports on whether drilling is straight.



SLUSH PUMP, a National C-250, and draw works are each powered by a General Motors twin 6-110 engine.



NORTH-COUNTRY RIG has drilled 69,600 ft. of "bush country" hole. The National T-45, operated by Gustavson Drilling Co., Ltd., of Calgary, uses 4½-in. drill pipe.

Bush-country driller sets fast pace

IN THE FAR NORTH a rig operated by Gustavson Drilling Co., Ltd., of Calgary is gaining a reputation for fast drilling in the "bush country" of northern Alberta, Canada.

The unit went into service in January 1959 and since has drilled four 8,300-ft. wells, two 7,300-ft. wells, two 5,200-ft. tests, and three 3,800-ft. tests. Total footage of new-hole drilling adds up to 69,600 ft., plus a considerable amount of workover and well servicing.

This may not appear to be an abnormal amount of drilling in some areas, but when you consider the terrain and moving obstacles encountered in this rugged country, it is noteworthy. The locations of the well sites were at Snipe Lake, Normanville, Deer Mountain, and High Prairie.

Normal depth range of the drill is from 4,500 to 7,500 ft. The National T-45 rig is designed for compactness making portability easy as possible in the area where it is difficult to reach by ground vehicles.

The draw-works compound and a General Motors twin 6-110 engine, rated at 419 hp., can be carried as one load. The slush pump is a National C-250 with an independent pump drive powered by another GM twin 6-110 engine equipped with a steel winterized housing and forms the second truckload.

The derrick is a 127-ft. Lee C. Moore which readily accommodates the 4½-in. drill pipe. The firm is headed by N. E. Gustavson, president, and according to Jim Young, tool pusher, the rig performed as well during the severe winter months as it did during summer.

Southeast New Mexico to get tests

PLANS have been announced to drill an exploratory well to test the Devonian formation at approximately 14,500 ft. in southwestern Lea County, New Mexico. The test well is located on a 4,988-acre federal unit, designated as the Mescalero unit.

Operator of the venture will be El Paso Natural Gas Co. In consideration for the drilling of this test well for Drilling & Exploration Co., Inc., of Dallas, El Paso and Western Natural Gas Co. will acquire an interest in the unit.

The Mescalero unit test is approximately 8 miles northwest of a significant discovery completed in early October. That well, the Ohio Oil Co. 1 Lea Unit, located upon a 2,559-acre federal unit in which Drilexco owns an interest, was dually completed in the Devonian at approximately 14,400 ft. and in the Bone Springs section (Permian) at approximately 9,500 ft. On potential tests this well flowed from the Devonian at the rate of 516 bbl. of oil per day, and from the Bone Springs at the rate of 214 bbl. of oil per day. A third productive horizon was discovered in this well in the Pennsylvanian section, where on drill-stem tests at approximately 13,000 ft. a flow at the rate of 3.2 M.M.c.f. and 388 bbl. of condensate daily was recorded.

A Pennsylvanian test well is scheduled for commencement within the next few months on the 7,520-acre proposed Mescalero Ridge Unit. El Paso and Western will also earn a portion of Drilexco's acreage interest in this prospect.

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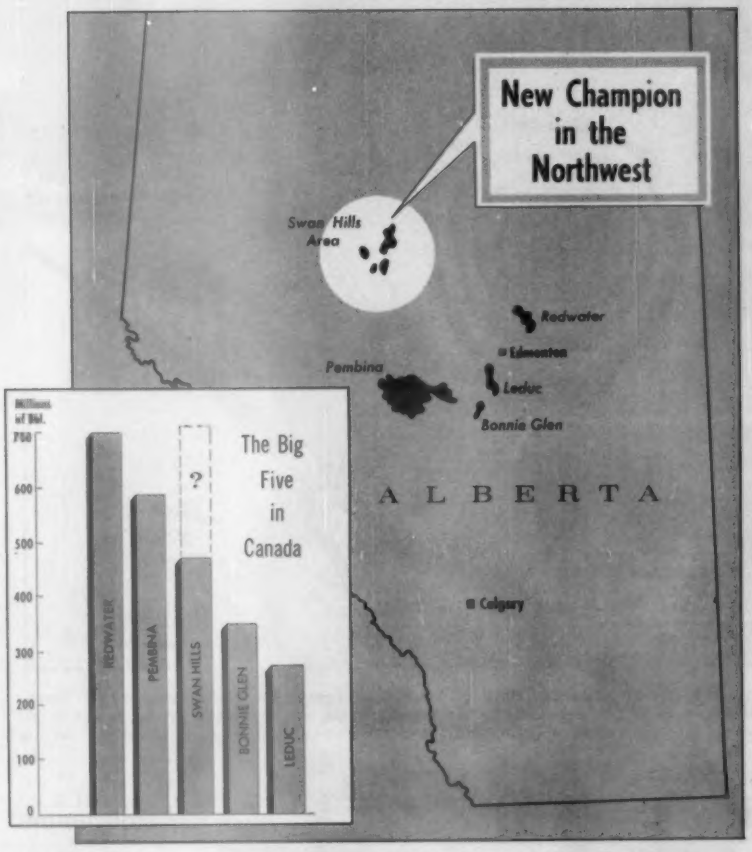


IN 3 YEARS, the remote Swan Hills region of West Central Alberta, has emerged as one of the largest, if not the largest, oil reservoir in Canada. Swan Hills field itself now ranks as third-largest field in the country, and promises soon to take over the No. 1 position.

Here's an area that rates extravagant acclaim

BY FRANK J. GARDNER

GIANTS GROW SLOWLY . . . giant oil fields, that is. The discoverer never knows just what he has uncorked when he finishes the first well. Sometimes it's months before a confirmation well is spudded. But when it becomes clear that something really big has been tapped, and the play gets going, the giant slowly takes shape.

It takes time . . . Classic example of slow takeoff was Alberta's Pembina field, now Canada's second-largest giant. The discovery drew little publicity in June 1953. Confirmation did not come until January 1954. But then the fire blazed, and Pembina quickly emerged as a 590-million-barrel reservoir. At the end of 1954, 140 wells had been dug; 644 wells were finished in 1955, and a 300,000-acre stratigraphic trap took shape, in a reservoir rock that had never produced oil before.

To unseat a champion . . . The pattern is being repeated in Canada today. A great oil field, acknowledged since 1958 as a giant, grows ever greater in the light of new information. Still undefined, Swan Hills and its satellite reservoirs at Virginia Hills, Judy Creek, and West Judy Creek, might well displace Redwater in the coming months as Canada's all-time champion.

Discovered by Home Oil Co., et al. in March 1957, a reef complex of Beaverhill Lake-Devonian age has slowly overtaken Leduc and Bonnie Glen, to take third place in the size race, ranking behind first-place Redwater (700,000,000 bbl.) and second-place Pembina (590,000,000 bbl.) in total recoverable reserves.

Recently revised estimates coming out of last month's MPR hearings before Alberta Oil and Gas Conservation Board show a hefty spurt of 164 million barrels at Swan Hills, 20 million at Judy Creek, and 31 million at Virginia Hills.

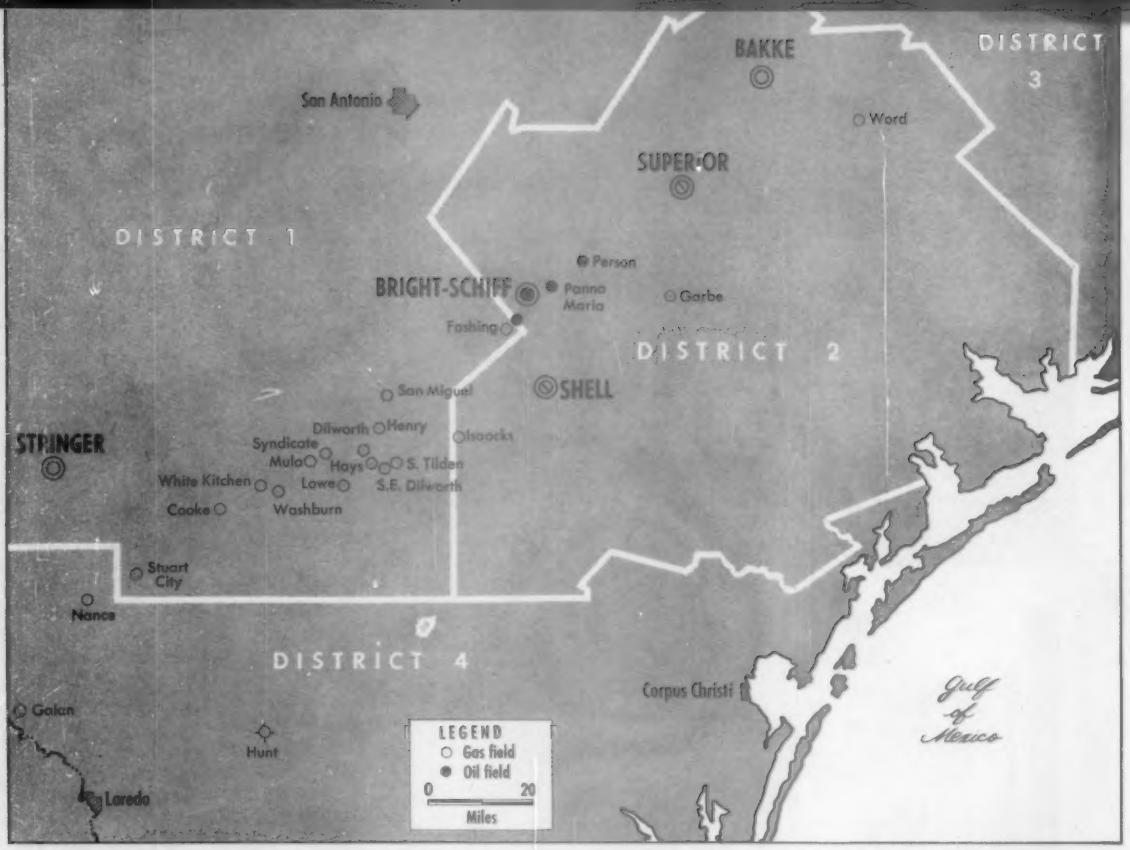
Last spring, Swan Hills was credited with 336 million barrels by the Alberta Society of Petroleum Geologists; today, it looks more like 500 million. The ASPG figure of 900,000 bbl. per 160 acres for Judy Creek now would give that 20,000-acre reservoir a giant reserve of 112,500,000 bbl. Add in about 20 million barrels for West Judy Creek (no dry holes between), and the field pushes the 133-million mark.

Ten miles west of Swan Hills, and partially defined on the east flank, lies Virginia Hills; here, a 13,000-acre reef reservoir now stands good for a minimum of 101 million barrels of recoverable oil, up 31 million from previous estimates.

Add them all up, and the total stands at 733,500,000 bbl. for the Swan Hills region. That's quite a bit more oil than Redwater, the present champ, can boast. It's unlikely, of course, that Swan Hills and Judy Creek will link, since there's some definition between them already. It's entirely unlikely that either will ever join with Virginia Hills. But a merging of Judy Creek and West Judy Creek is in the cards, and here we could see another half-billion-barrel field if all goes well.

And set new records . . . Remembering that not one of the four fields is yet defined, this reef play must be dubbed nothing less than the most rewarding 3 years in Canadian oil history, and the most important in this hemisphere in the last 10 years.

Like Pembina, the Swan Hills discoveries gave Canadians an entirely new reservoir rock that had never produced before. Like Pembina, and Leduc, and Redwater, and Bonnie Glen, they opened big strat traps. And like Canada itself, their future seems unlimited.



THE 22 FIELDS DISCOVERED SO FAR along the Deep Edwards Trend of Southwest Texas are shown above. Of these, 18 are gas fields (open circles), 3 are oil fields, and 1 (Fashing on the Karnes-Atascosa county line) produces both oil and gas. Four key wildcats are drilling along the trend and may reveal important new information bearing on its future. These are shown in bold type on the map.

Here's an editorial tour of the

deep Edwards trend

PART 2 (CONCLUSION)

BY GEORGE R. PINKLEY

EVIDENTLY, this 200-mile play is only in its beginning stage. There is much to be learned about the areal as well as the vertical extent of this prolific reservoir.

The individual Edwards fields are here grouped by counties, and the editrial tour proceeds from southwest to northeast. New fields appear along the trend almost weekly, and a few October and November discoveries could not be included.

Starting at the Rio Grande, we find this parade of producing fields:

Webb County. Galan field was discovered by Copano Oil, et al., 1 Trevino in November 1958. One additional well is still testing. P.C. 8,970-9,014 ft. SIP 2,350 psi. The field is 35 miles northwest of Laredo. No market exists at present. One well is testing in Sligo zone.

Nance field is 11 miles northwest of Encinal. One well (Pan American 1 Garner) was tested in November 1958. Edwards is productive at 9,722-10,020 ft., treated with Petrofrac; SIP was 2,950 psi. No additional drilling is reported. This is on a ranch owned by former Vice President John Nance Garner. These wells do not have a pipeline connection yet.

LaSalle County. Cook field was discovered in February 1956 by Stanolind 1 Cooke and is 14½ miles northeast of Stuart City. Edwards lime was perforated 10,286-10,326 ft. It made 4.6 M.M.c.f. on open flow, SIP 3,800 psi. Now three additional wells have been completed but field is not outlined.

GAS PRODUCTION—COOKE, LASALLE COUNTY

	M.c.f.
1958	0
1959	236,232
1960*	330,536
Total	566,768

*Six months.

Stuart City field was opened by Stanolind 1 Martin in February 1954. The Edwards lime flowed 5.5 M.M.c.f. with pipe perforated at 10,092-10,120 ft. Field now has 12 producers in this horizon.

A detailed description of Stuart City was published in the Corpus Christi Geological Society, May 1959, field-trip guide. It is over 5 miles long and 1 mile wide and is open to the northeast. Structure is relatively unimportant. A reef in the Edwards forms a northeast-southwest ridge.

The Eagle Ford rests on the Edwards on the crest with the Buda, Del Rio, and Georgetown thickening on the flanks. Permeability is the con-

GAS PRODUCTION—STUART CITY

	M.c.f.
1958	0
1959	684,671
1950*	1,274,015
Total	1,958,686

*Six months—10 wells.

Paper presented at Southwestern Federation of Geological Societies, Abilene, Tex., October 1960.

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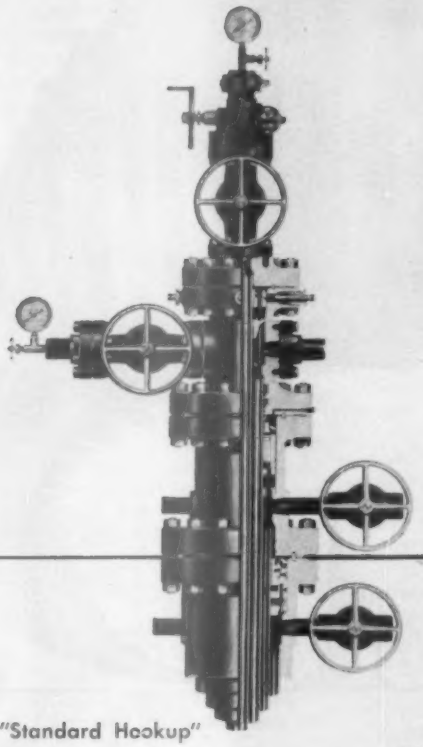

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trolling factor in production. Some faulting is suspected but difficult to prove due to loss of section around the reef buildup.

White Kitchen field, between Washburn Cooke fields of northeast LaSalle County, is a poorly defined area in need of additional drilling. Originally a minor Wilcox field, deeper drilling discovered Edwards gas in August 1956, when Lee Bros. 2 Storey was completed as a 1.8 M.M.c.f. well at 10,303-10,430 ft., SIP 3,315 psi.

One additional well has indicated a better potential. Lack of drilling precludes detailed structural analysis, but an old seismic map shows an irregular folded pattern which probably is a reflection of reef development in the Edwards.

GAS PRODUCTION—WHITE KITCHEN

	M.c.f.
1958	67,598
1959	250,014
1960*	149,125
Total	466,737

*Six months.

At Washburn field, drilling in 1954 confirmed the presence of a commercial field around an old Quintana blowout when Standard Oil of Texas completed 1 South Texas Syndicate in June for 10 M.M.c.f. open flow with 3,850 psi. SIP, GOR 445,000/1, perforation at 10,258-10,346 ft.

A second well to the northwest extended the field over ½ mile. The geology of the old Wilcox field indicates that considerable faulting is present in the area. This trend across LaSalle County indicates a complex of stratigraphic and structural problems which will need additional drilling for solution.

GAS PRODUCTION—WASHBURN

	M.c.f.
1956	46,511
1957	0
1958	700,426
1959	1,488,827
1960*	732,722
Total	2,968,486

*Six months.

McMullen County. Mula Pasture field was discovered in April 1957, by Jupiter Oil Co. 1 South Texas Syndicate. It made 12.8 M.M.c.f. from the Edwards at 10,557-77 ft. with SIP 3,286 psi.

It is between Syndicate and Washburn fields and may be in the same reservoir. Lack of nearby drilling makes it difficult to outline a structural pattern in the area.

"Lowe is a one-well field that was unusual because it yielded sweet gas from a horizon above the Edwards, the only one on the trend so far... The section exposed is Kiamichi and Edwards."

GAS PRODUCTION—MULA PASTURE

	M.c.f.
1957	24,815
1958	18,700
1959	54,951
1960*	55,777
Total	154,243

*Six months.

The Syndicate field discovery on the west side of the county failed to produce properly on production tests and has been abandoned.

Smith 1 South Texas Syndicate was completed in January 1955 as a 4-M.M.c.f. well with casing perforated at 10,658-83 ft. in the Edwards. It had a SIP of 4,025 psi. and a reasonable drawdown on small chokes. Lack of pipeline prevented immediate sale of gas and its failure may be due to mechanical causes resulting from a long shut-in period. Further drilling is needed in the area to determine subsurface condition.

Lowe is a one-well field that was unusual because it yielded sweet gas from a horizon above the Edwards, the only one on the trend so far. Discovery was Amerada 1 Craig in October 1956. It reported an open flow of 97.5 M.M.c.f. with SIP 5,330 psi. Pipe was set at 13,681 ft. and TD is 14,480 ft. The section exposed is Kiamichi and Edwards. Exact producing horizon is a matter of guesswork, but the character of the gas is different from normal Edwards and it is probably from the Kiamichi. Recovery of 1.23 billion cubic feet of gas failed to pay for the cost of this very expensive well. Two dry holes to the southeast and southwest have limited the field in that direction.

This test showed a thickness of 2,000 ft. of Georgetown and Kiamichi which is absent on the reef fields a few miles north, showing a rapid thickening downdip. This makes Edwards prospecting on this contour quite expensive.

GAS PRODUCTION—LOWE

	M.c.f.
1956	10,000
1957	232,131
1958	994,756
1959	0
Total	1,236,937

Dilworth (salt dome) field had a long and disappointing history. Its discovery by seismic survey led to drilling in 1949, and some oil was produced from Wilcox and Yegua sands in 1950. Production failed to be commercial, but did establish the presence of salt in the 7,700-ft. zone—confirming the seismic survey and proving the presence of a new interior salt dome basin in South Texas.

Edwards gas was discovered by Humble 2 Dilworth which yielded 36.5 M.M.c.f. on the Edwards at 10,670-10,710 ft. on the north flank of the dome, SIP 4,250 psi. Ownership of the base lease is split up among several partners which has made operations slower than normal on a structure of this type.

GAS PRODUCTION—DILWORTH SALT DOME

	M.c.f.
1959	236,232
1960*	173,884
Total	410,116

*Four months.

Dilworth Southeast field was opened by Standard of Texas 1 Dilworth in February 1955. It was discovered by seismic survey and is mapped as a thick reef development with little structure evident on the shallower beds.

The discovery well was drilled to the top of the Glen Rose 12,592-12,758 ft. where it had a gas show. Mechanical trouble forced a side-track completion in the top of the Edwards 11,252-70 ft. where it made 11.3 M.M.c.f., with 4,390 psi. SIP.

There are now four producers, one drilling well, and three dry holes on the structure.

GAS PRODUCTION—DILWORTH SOUTHEAST

	M.c.f.
1956	247,116
1957	3,490
1958	1,105,353
1959	3,467,000
1960*	2,073,848
Total	6,896,807

*Six months.

Tilden Southwest field is in a fault segment on the flank of the southeast Dilworth reef. It was discovered by Texas Eastern & Prod. Corp. 1 Hayes in April 1956. It made 1.8 M.M.c.f. from Edwards at 11,260-11,305 ft. with 4,240 psi. SIP. The producing reservoir is probably small in size and no additional drilling has been attempted.

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"San Miguel field was originally a surface prospect confirmed by seismic survey and is considered a deep-seated salt dome... The drilling to date indicates considerable faulting and the lime around the dome is evidently thoroughly fractured."

GAS PRODUCTION — TILDEN SOUTHWEST

	M.c.f.
1958	75,646
1959	269,778
1960*	122,726
Total	468,150

*Six months.

Henry salt dome is 5 miles west of Tilden on the north bank of the Frio River. This structure was located by seismic survey many years ago. The first deep test, Stanolind 1 Henry, drilled to 14,046 ft. back in 1948 and was abandoned due to mechanical difficulties.

The discovery was made by Standard of Texas 1 Henry in August 1956, with a potential of 40 M.M.c.f. SIP was 3,875 psi. and it was an open-hole completion in the Edwards at 10,549-11,060 ft. Two additional deep wells were completed and it is noted from the gas sales that the performance of the lime wells is not satisfactory.

The deep drilling uncovered good oil showings in the top of the Wilcox (Carrizo sand) and several excellent oil wells at 3,500 ft. will ultimately make the field a profitable venture.

GAS PRODUCTION—HENRY

	M.c.f.
1956	1,629
1957	0
1958	294,286
1959	149,437
1960*	29,034
Total	474,386

*Five months.

Tilden South field was opened by Producers Corp. and Coquat 1 Dickinson in 1954. It made 15 M.M.c.f. from Edwards lime with 4,500 psi. SIP. Casing perforated 11,419-56 ft. There have been two dry holes drilled to the south and east, two gas wells to the north and northeast and one well is now drilling to the west.

A desulfur plant is located on the edge of the field which serves several wells in other nearby fields.

The structure appears to be a fault-reef development which has a surface expression resulting from draping and compaction of shallow beds. It was first tested for shallow sands in 1934 and several Wilcox tests were drilled in 1950-53.

GAS PRODUCTION—TILDEN SOUTH

	M.c.f.
1956	55,360
1957	18,700
1958	867,099
1959	1,806,941
1960*	775,000
Total	3,523,100

*Six months.

San Miguel field was originally a surface prospect confirmed by seismic survey and is considered a deep-seated salt dome.

Wilcox sand production from the 5,400-ft. zone was opened in 1948, with additional sands being added in 1954. Some of the producing reservoirs were small and noncommercial. Deep Edwards gas was opened by Humble 1 Louis Gubbels in October 1953, as a 70 M.M.c.f. well. This is another open-hole completion with the section from 10,149-82 ft. open; SIP was given as 3,700 psi. Later study indicated an unlimited open flow, a rate of 1 billion cubic feet was published as the official potential.

The drilling to date indicates considerable faulting and the lime around the dome is evidently thoroughly fractured. Additional drilling is needed to outline the capability of this field.

GAS PRODUCTION—SAN MIGUEL

	M.c.f.
1954	137,498
1955	0
1956	0
1957	0
1958	2,000
1959	0
1960*	201,880
Total	341,378

*Six months—2 wells.

Live Oak County. Isaacks (East Calliham) is a one-well field on the west line of the county. It was discovered in August 1957 by Standard Oil of Texas 1 Isaacks. Edwards lime was perforated at 12,456-12,736 ft. making 1.3 M.M.c.f. with 2,700 psi. SIP. Numerous showings deeper in the lime failed to respond to acid treatment. A second well in the Calliham townsite 2 miles west was structurally higher but found no porosity.

Subsurface geology suggests a reef ridge with variable porosity and permeability. Further drilling may develop a field similar to Stuart City. There is no record of any sale of gas from this well.

Atascosa County. In Fashing field, it is difficult to condense the story into a few words; it has had a long and interesting history both from a commercial and geological viewpoint. It has produced more gas than any other field on the trend, thanks to a favorable market, and is the largest reservoir determined to date.

Early surface work established the presence of faulting in the area and a favorable prospect was outlined. Shallow gas in farmers' water wells was the first clue to the possibilities of the feature. A series of shallow wells failed to find production in the Jackson sands which are good oil zones to the southwest, but the drilling did confirm the fault pattern which encouraged deeper drilling.

Gulf Oil Co. combined surface and seismic work and took a large block of leases in the area. It drilled the 1 Ada Tom to a depth of 10,528 ft. in January 1945. This well tested sulfur gas in the Edwards topped at 10,365 ft. but did not attempt a completion. Lack of market was probably the primary reason for this action.

In 1946, Gulf farmed out acreage to Smith, Mowinkle & Skinner Corp., who drilled the discovery well in the prolific Carrizo (Upper Wilcox) sand zone. Over 30 producers outlined production in the 3,600-3,800-ft. zone. Smith drilled an Edwards well on the Schuman farm in 1952; it is not known why this well was not completed.

Lone Star Producing Co. studied the area, did seismic work and drilled its 1-A Urbanczyk. This was completed as a dual gas well, making 24.6 M.M.c.f. from the upper or A zone in the Edwards at 10,400-50 ft. with 4,020 psi. SIP. The lower B zone made 26 M.M.c.f. from 10,791-10,851 ft. with 3,950 psi. SIP.

Development followed and there are now over 40 gas wells, many of them dual completions. There are five dry holes around the field which define the water level and the fault pattern. There are three processing plants which desulfur the gas and recover condensate, and another plant is needed as there are still five wells shut in for lack of this facility.

Structure of the field is relatively simple. It is an upthrown fault block bounded by an arcuate fault down on the northwest. The surface beds show a movement of about 175 ft. which cuts Jackson beds (Eocene) but does not affect the overlapping Catahoula (Miocene). On the Carrizo zone the

movement is slightly greater, up to 250 ft., while at the base of the Wilcox there is a throw of 450 ft. On the Edwards the throw is 600 ft., approximately the amount of the gas column in the reservoir. Electric-log study shows a thinning of the Austin and Eagle Ford on the top of the uplift which indicates 340 ft. of structural growth in those times, which might be either nondeposition or truncation. Additional downdip wells are needed to determine this factor.

The porosity and permeability vary across the structure, which accounts for the wide differences in deliverability of wells. Some reef lime is present in wells with good porosity, which increases the available reserves. The highest well reaches the Edwards at −9,780 ft. and the gas-water level is at −10,380 ft. The field has a proved length of 9 miles and width up to 2 miles.

The deepest well in the field, Lone Star 1 Tom, reached a total depth of 13,960 ft. but did not get through the Lower Cretaceous-Hosston series. It had excellent gas showings in the Glenn Rose section, indicating that the field should have further deep testing. The northeast well, 2 Weddington, was the first well completed as an oil producer, making 412 bbl. per day of 34° oil from 10,844-59 ft. Gas-oil ratio was 990/1 and tubing pressure 1,625 psi. on 3/16-in. choke. The structural study shows no reason for this oil accumulation; it is considered as a local permeability trap. Other wells in the field have gone from gas to water in this zone. A second oil well was added in October 1960.

A preliminary paper was published in the January 7, 1957, issue of The Oil and Gas Journal by R. M. Knebel, Lone Star geologist, who has directed geological work in the area. A more detailed paper was presented by George R. Pinkley at the December 1958 meeting of the South Texas Geological Society, when more data were available.

FASHING FIELD

A Zone

	M.c.f.	Wells
1958	4,870,442	21
1959	22,327,466	35
Total to May 1, 1960	35,937,000	..
B Zone		
1958	6,662,597	19
1959	22,226,337	25
Total to May 1, 1960	37,583,000	..
Total for field	73,520,000	..

Liquids 1959.	Bbl.
A zone	338,369
B zone	371,448

Karnes County. Persons field is located in north-central Karnes County. It was here that the pattern of continuous gas discoveries was interrupted by the discovery well, Brazos Oil & Gas 1 Persons.

A field over 5 miles long with oil and gas in two zones in the Edwards lime has been developed by the drilling of 25 wells of which only one was a dry hole. The structural pattern is not fully outlined but an up-to-the-coast fault is present in beds below the Wilcox, indicating pre-Eocene uplift.

The discovery well on August 29, 1959, made 650 bbl. of oil per day on 17/64-in. choke with 1,550 psi. TP, gas-oil ratio 1,430/1, perforations 10,886-10,900 ft.

Attempts to make dual completions have failed, probably because of fracturing in the lime section which complicates the cementing program. Minor faulting may be present which will form several separate reservoirs in the major fault block.

PRODUCTION DATA

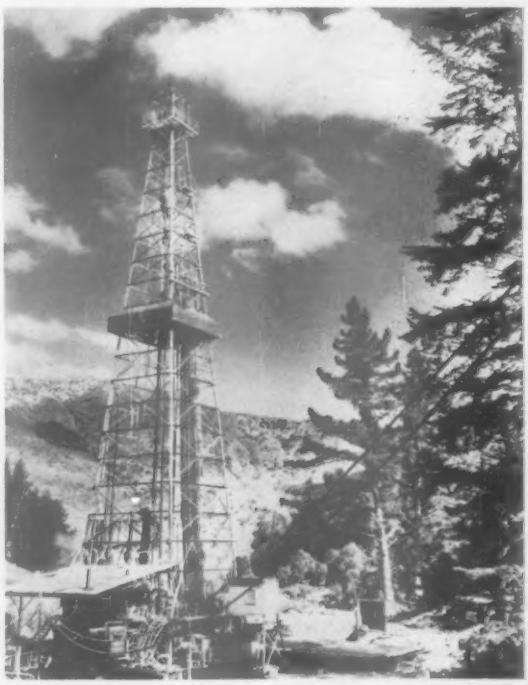
	Bbl.
1959	56,691
1960 May production:	
Upper zone, 11 wells	15,789
Lower zone, 7 wells	5,252
1960 August allowable:	
Upper zone, bbl. per day	2,833
Lower zone, bbl. per day	784

The schedule for August was only 8 days, so the total for the month will be less than 29,000 bbl. gross. Wells of this depth on 80-acre spacing and discovery allowable would normally be allowed 285 bbl. a day for 30 days.

Lavaca County. Word Edwards field was drilled as a deep test on an old structure; the completion of 1 Kahanek excited operators by encountering production in a thick section of Edwards lime at a depth of 13,320-14,278 ft., the greatest saturated zone reported to date.

The owners, Mobil Oil Co., had mechanical troubles which delayed the completion and possibly decreased the well potential, announced as 3.6 M.M.c.f. open flow. Flow of 1.3 M.M.c.f. on ¼-in. choke with 1,400 psi. tubing pressure and 14,200/1 suggest a commercial well.

Little is reported on the geology though there is evidently marked truncation or major reef development. Since there are a large number of similar structures on this trend which also produce from the Wilcox, this discovery opens endless possibilities. It is not known if any gas has been sold from this well.



MANGAONE 1 wildcat near Nuhaka on the North Island of New Zealand is drilling near 4,000 ft. This test is being drilled by BP Shell and Todd Petroleum Development Co., Ltd., with the BP Group as managing partner for the company.

Drillers look for first oil in New Zealand

LAST MAY 5, a deep wildcat in New Zealand for Shell-BP and Todd Petroleum Development, Ltd., was spudded in at Mangaone, near Nuhaka on the east coast of the North Island. The 1 Mangaone will drill to 12,000 ft., if necessary. On November 1 the well

was down to about 4,000 ft. with a National 100 outfit doing the drilling.

BP is the managing partner and is responsible for the administration and staffing of the drilling company. Spudding in was made quite a ceremony. Chairman of BP Shell and Todd Petroleum, Ltd., L. G. Hicks, the Hon. F. Hackett, Minister of Mines, and the Hon. J. R. Marshall, Deputy Leader of the Opposition, together with H. J. Russell, a member of the board of directors of the company, and T. L. Harland, administration manager, attended the spudding in. Drilling superintendent is R. Ambrose. Heavy rain marred the operation, but it went through without a hitch regardless.

First Activity. This is the first drilling operation in New Zealand this year. The islands remain as one of the last oil-barren domains in Oceania.

Last year, Kapuni 1 in the Taranaki basin on the west coast of North Island, was suspended at 13,040 ft. Wet gas was tested at 12,268-80 and 12,366-95 ft., but the shows were considered noncommercial. This wildcat was encouraging enough to warrant this year's wildcat on the east side of the island.

The Shell-BP-Todd group carried out geological and geophysical work in the Hawkes Bay area on the east coast of North Island last year. It is here that this year's well is being drilled.

British Petroleum of New Zealand carried out 1.5 party-months of geological field work on its Cape Campbell concession in the northeastern part of South Island last year.

Kansas field extended in western Pratt County

A western Pratt County field in Central Kansas was extended to the southeast about ¾ mile. Braden Drilling Co., Inc. continues to develop successfully Carver-Robbins field. The 1 Jack, SW NE NE 27-27s-15w, flowed 1,450 M.c.f.d. during test at 4,475-4,538 ft. in the Cherokee Pennsylvanian.

About 1½ miles northeast Braden is completing at 1 Welsch, a possible discovery well in NE SW SW 24-27s-15w. A drill-stem test in the Cherokee at 4,460-88 ft. flowed 499 M.c.f.d.

Seward County. Thomas & Brewer Oil & Gas Co. are completing at a new well on the north edge of Kismet field in eastern Seward County, southwestern Kansas.

The 1 Simonson, C SE NW 23-33s-31w, flowed gas in the Council Grove Permian at 3,052-3,155 ft. A test in the Mississippian at 5,780-5,804 ft. got 1,450 M.c.f.d. Location is sep-

Another plus value:

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Also, Seeco-Mul is the best E-P lubrication agent you can run. So you get both, and save money, too.

So-called drilling soap and drilling detergent materials range from commercial, household detergents, which contain only about 15 per cent active surface tension reducing agent and 85 per cent water softener (such as soda ash, phosphates, etc.), to solutions of various fatty soaps and detergents in water. Some of these materials have no film-forming characteristics and actually dissolve whatever lubrication properties there are in the system away from the bit bearings and races. They also accelerate corrosion and pitting of the drill pipe and collars.

There are some lubricating qualities in such materials, but in order to achieve the concentration necessary to be effective in the system, the cost would be much more than any benefits derived from their use. Some of these solutions contain as much as 80 or 90 per cent water — yet cost as much as $4.00 per gallon. In dry form, this means that the active material could cost as much as $2.35 per pound, compared to less than 1/10 of that amount per pound for Seeco-Mul.

Seeco-Mul is often used as a drilling soap because it is one of the most efficient surface tension reducing agents available. It is a chemical emulsifier with superior wetting ability, and in addition Seeco-Mul is an effective extreme pressure lubricant.

The combined action of E-P lubrication and low surface tension not only affords greatly increased bit bearing life, but increases the penetration rate also. Since a tough, impervious film is formed on all metal surfaces, hydrogen-weakening (and subsequent failure) of bit bearings, drill pipe, and collars is practically eliminated. This protection is valuable in water containing hydrogen sulfide and other inorganic sulfides ("sulfur water").

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6. Lower mud costs.

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Additive	None	Seeco-Mul	Soap "A"	Soap "B"
Description	—	Dry Flake	Water Solution	Water Solution
Concentration	—	½#/Bbl.	½#/Bbl.	½#/Bbl.
Surface Tension Dynes /CM, 25°C.	74	29	29	30
E. P. Test	Failed 25 In./Lbs.	Passed 400 In./Lbs.	Failed 90 In./Lbs.	Failed 120 In./Lbs.
Equivalent Timken Reading	10 Lbs.	97 Lbs.	38 Lbs.	49 Lbs.

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arated from Kismet production by the depleted discovery well of the field. East and South Kismet fields are now combined into Kismet field. Production is oil from Lansing-Kansas City, Marmaton, Morrow, all Pennsylvanian, and from the Mississippian.

Sumner County. A southern Kansas confirmation well is waiting on state test. It is Donald C. Slawson 1 Dundore in NW NW SE 26-33s-2e. Flow was 8 bbl. per hour during tests of the Mississippi at 3,302-08 ft. The field was opened in September at 1 Holman in SW SW NE 26-33s-2e. It made 170 bbl. of oil daily from Mississippian at 3,306-12 ft.

Three more wells completed off California

THREE more wells have been completed in the California tidelands off Santa Barbara County and one is on a lease which is a big question mark to all operators other than the two leaseholders, Standard Oil Co. of California and Humble Oil & Refining Co.

Standard of California, operator for the two companies, has completed the Standard-Humble 5-A Gaviota State in Parcel C. The two companies have completed four other wells on the 3,840-acre parcel, but all have been tight holes.

The operator has reported one well had a show of gas and condensate, but no complete report on any of the wells has been reported.

The new completion was drilled to a total depth of 8,020 ft. However, this is a deviated hole whipstocked from an onshore drill site. Vertical depth of the well has not been released.

Down the Santa Barbara County coast a few miles, Standard of California has completed two more wells in the Summerland lease, another joint venture with Humble.

Both wells were drilled from offshore platforms, one from "Helen" and the other from "Hazel." One well was drilled to a total depth of 7,348 ft. and the other to 7,002 ft. These also are deviated depths rather than vertical depths.

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Recently CSI was recalled—again on a competitive basis—to protect the other 25 wells. CSI again installed rectifiers. CSI also submitted a report covering all installation data, and instructed company personnel on the operating of the rectifiers.

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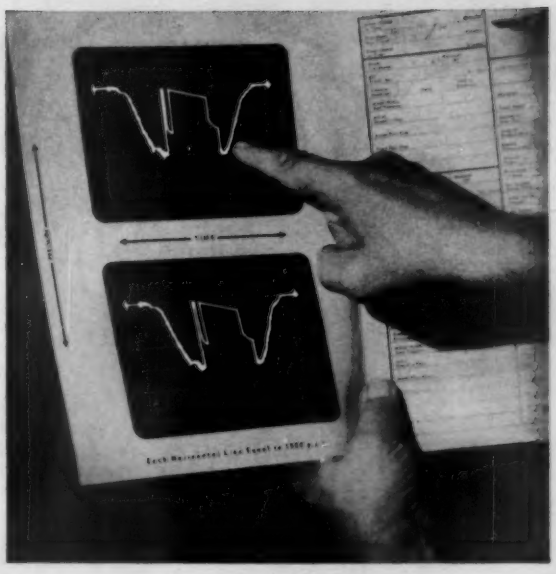
DEEP gas production is indicated at a remote Texas wildcat.

Big Ellenburger find for Texas

AN IMPORTANT Ellenburger gas discovery looms at the gates of the Val Verde basin in Terrell County, West Texas. Discovery well is Sinclair Oil & Gas Co. 1 Alma H. Pounter.

This wildcat, 20 miles southwest of Sheffield in the so-called Sheffield Channel, flowed 5,100 M.c.f.d. at 6,254 ft. during drill-stem test. But at 14,030-14,596 ft. in the deep Ellenburger the well flowed up to 3,372 M.c.f.d. of wet gas. Tests continue at the significant gas find. Location is 6 miles northwest of deep multipay Brown-Bassett field in Section 21, Block 1, TCRR Survey. Brown-Bassett, one of the big fields in this section of Texas, has production from Ellenburger below 14,100 ft., Fusselman Silurian, and Wolfcamp Permian.



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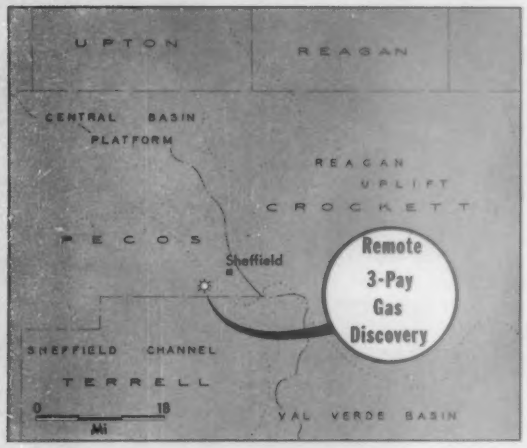

A GEOLOGICALLY remote area of far West Texas picked up its most important 1960 gas find. Discovery is Shell and Humble 1 Blackstone-Slaughter, 5 miles southwest of Sheffield in Pecos County.

Strike confirms Oklahoma well

Hunton-Siluro Devonian production is assured the confirmation well to a northwestern Oklahoma discovery in Major County. Confirmation well is Pan American Petroleum Corp. 1 Barnes in C NE SW 3-22n-15w, 7½ miles northeast of Sherman, 4 miles northwest of South Campbell, the first Hunton well in the entire Anadarko basin about 3 years ago, and 2½ miles southeast of the new field's discovery well at East Campbell.

The well, an old well worked over, flowed 830 bbl. of oil and 9 M.M.c.f.d. from 8,041-44 ft.

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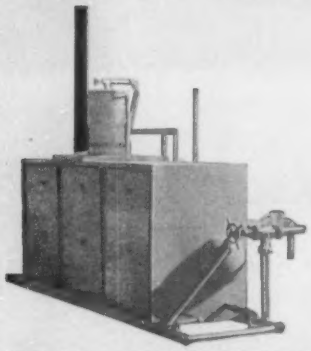

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West Texas well opens remote area

A TRIPLE-PAY gas discovery came to a remote—geologically and productionwise — area of West Texas. Shell Oil Co. and Humble Oil & Refining Co. completed 1 Blackstone-Slaughter in extreme eastern Pecos County, 5 miles southwest of Sheffield with production from Connell Ordovician at 9,993-10,012 ft., Pennsylvanian production from 8,190-8,310 ft., and Ellenburger Cambro-Ordovician at 10,050-60 and 10,082-92 ft.

Gas flow from the Pennsylvanian detrital zone was 5,600 M.c.f.d.; from Connell it was 12 M.M.c.f.d., and from Ellenburger the well made 16,500 M.c.f.d. Location is 11 miles southeast of Sheffield field in Section 19, Block A-2, TCRR Survey.

Important find. This is one of the most important discoveries in far West Texas since Atlantic 1 Kelly and Mobil 1 Moore earlier this year, also Pecos discoveries. Its location on the extreme southern end of the Central basin platform in the channel area that separates the Delaware and Val Verde basins marks a new spot for explorers to take a second look. Nearest deep production is at Puckett to the southwest.

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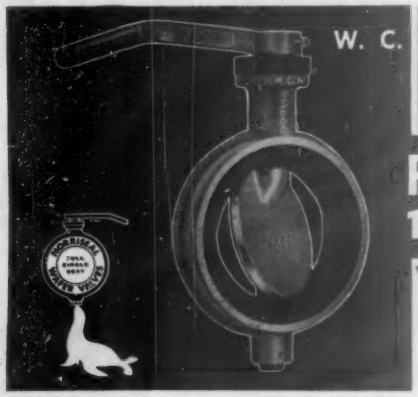

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Dual completion reported at Oklahoma discovery

A wildcat north of abandoned Southwest Douglas field in Garfield County, North Central Oklahoma, was dually completed in upper and lower Marshall sands. Discovery is Midland Oil Co. 1 Baylor in C SW NW 26-21n-5w.

The well flowed 150 bbl. in 7 hours through 10/64-in. choke from lower Marshall at 6,871-76 ft. From upper Marshall it flowed 237 bbl. in 11½ hours through 10/64-in. choke from 6,842-52 ft.

McClain County. In Central Oklahoma, Fred Morgan and Golden Falcon Oil & Gas Co. dually completed 1 Schuman in C SW NE 6-5n-2w. The well flowed 7 bbl. of oil per hour from lower Hart sand at 7,595-7,614 ft. and 5 bbl. per hour from the Hunton lime at 7,796-7,816 ft.

At Southwest Ladd field, Superior Oil Co. is testing Bromide Ordovician sand at 1 Berndt in C SE SW 6-7n-2w, north of the field. The wildcat flowed 112 bbl. of oil in 21 hours through 9/64-in. choke from perforations at 8,432-46 ft.

Dover. A big well was completed in North Dover field, Kingfisher County, Central Oklahoma. Sinclair Oil & Gas Co. 2 Myers in C SW SE 22-18n-7w flowed at the daily rate of 1,680 bbl. from Manning Mississippian perforations at 7,027-53 ft.

King-Stevenson Oil Co. completed 1 Tharp in C NE SW 27-18n-7w flowed 240 bbl. of oil per day from Manning at 7,067-73 ft. It also flowed 240 bbl. per day through open hole at 7,089-7,129 ft. on 12/64-in. choke from Meramec.

A possible three-pay well at East Hennessey is Humble 1 Rikli in C NE SE 2-19n-6w.

West Texas wildcat now has Atoka Penn show

The southwest offset to Anderson-Prichard Oil Corp. recent 1-14 Fasken unit discovery in Ector County, 14 miles north of Odessa in West Texas, has yielded oil on test in the Atoka Pennsylvanian.

Indicated confirmation discovery is 2-14 Fasken unit in Section 14, Block 42, T-1-N, T&P Survey. A drill-stem test at 10,033-10,105 ft. got free oil on test. Recovery was 150 ft. oil, 350 ft. heavily oil and gas-cut water blanket, 35-50% oil, 400 ft. of oil and gas-cut water blanket, 10% oil, and 90 ft. gas-cut fluid. Drill-stem tests in the Wolfcamp also recovered oil.

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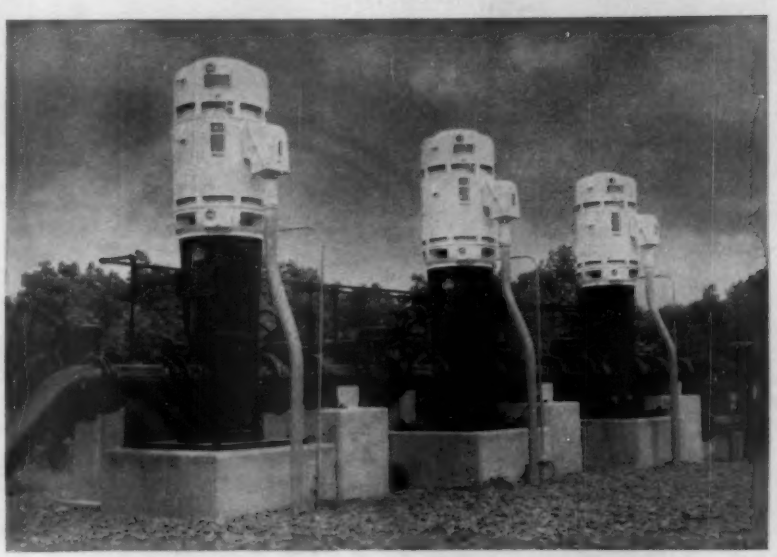

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October footage rundown . . . in the U. S.

	FIELD WELLS					WILDCAT WELLS			
	Oil	Cond.	Gas	Dry	Service	Oil	Cond.	Gas	Dry
Alabama	45,925								22,851
Alaska									3,013
Arizona									5,799
Arkansas	78,809		12,534	64,618					19,923
California	275,682	8,850	32,237	101,517		8,871		13,012	149,917
Colorado	17,781		52,952	16,744		4,970	6,321	9,828	149,817
Idaho									1,182
Illinois	146,788					16,690			66,050
Indiana	27,162			59,701	10,522	2,206			37,004
Kansas	403,930		66,145	226,204	60,506	41,545		23,187	258,707
Kentucky	80,886		41,967	97,823		15,727		7,614	38,865
Louisiana	1,060,908	354,167	63,422	532,032		32,967	45,509	11,303	378,590
North	156,446		63,422	180,042		21,807		11,303	116,913
South	717,487	251,628		252,666		11,160	35,776		237,626
Offshore	186,975	102,539		99,324			9,733		24,051
Michigan	114,984		13,988	78,300	5,520	3,467			111,533
Mississippi	191,564	74,072		69,342		32,949		4,227	173,659
Montana	61,417			29,397	1,603	7,864		2,242	52,700
Nebraska	77,815			90,208		7,237			271,884
New Mexico	376,451		233,745	104,543	2,274				18,991
West	85,677		221,306	33,640	2,274				3,463
East	290,774		12,439	70,903					15,528
New York	10,840			3,933	7,997				
North Dakota	75,330			16,758		9,725			48,559
Ohio	103,107		50,186	35,574	43,053			3,967	16,920
Oklahoma	509,311	12,729	132,773	181,434	89,343	87,606	11,070		126,377
Pennsylvania	32,487		81,438	30,800	42,350				17,650
South Dakota									5,158
Tennessee						1,040		1,000	6,379
Texas	2,119,276	551,769	224,548	874,631	68,225	141,964	24,190	13,862	966,510
Dist. 1	142,040	13,120	13,389	34,540					86,624
Dist. 2	70,979	107,747	50,677	66,847		13,791		4,102	87,181
Dist. 3	196,821	113,584	4,520	181,105		25,150			178,790
Dist. 4	102,791	81,226	22,884	78,739	6,096	5,350	24,190		93,318
East	239,783	34,738	5,949	72,709	3,565				120,801
Dist. 7-B	186,608	7,313	15,030	116,517	900	22,587			117,031
West	759,135	62,839	27,318	124,994	25,365	46,649		9,760	136,697
Dist. 9	253,446	28,953	12,083	145,105	18,870	28,437			101,989
Dist. 10	167,673	102,249	72,698	54,075	13,429				44,079
Utah	35,267			3,607					53,919
Virginia			39,584						
Washington									16,775
West Virginia	26,787		186,057	39,388	10,700			6,525	6,118
Wyoming	213,831		26,945	46,414		11,827		6,880	152,507
Total U. S.	**6,086,338**	**1,001,587**	**1,258,521**	**2,803,157**	**425,929**	**426,655**	**87,090**	**103,647**	**3,177,357**

. . . and in Canada

Total	**709,806**		**70,270**	**78,975**	**5,750**	**41,987**		**51,047**	**210,943**
Alberta	532,679		58,184	52,556	5,750	37,987		46,656	155,751
Saskatchewan	151,080			12,433		4,000			34,214
Manitoba	16,847								
British Columbia	9,200		12,086	13,986				4,391	20,978

Discovery wells

CANADA

Alberta:

Shell 10-23 Worsley, LSD 10, 23-87-9w6. D3 gas discovery. TD 8,255 ft.

Cities Service 6-15 Mound, LSD 6, 15-34-3w5. Cardium oil discovery. TD 8,283 ft.

Supertest-Altan-A-H.B. 10-26 Caroline, LSD 10, 26-36-6w5. Cardium oil discovery. TD 9,200 ft.

COLORADO

Washington County:

Dow & McHugh-B. F. Allison 1 Brown, C SW SW 19-1n-53w. IPP 125 BOPD, cut 10% b.s. and w. "D" sand 4,933-40 ft. TD 5,076 ft. "D" sand discovery, new field.

ILLINOIS

Edwards County:

F. L. Beard 1 Hattie Thread, NE¼ 6-1s-11e. IP 10 BOPD, Waltersburg 2,387-91 ft. TD 2,391 ft.

Macon County:

Pure Oil Co. 1 Mable Whitley, NE NE NW 28-16n-1e. IP 138 BOPD, 13 BWPD, Silurian 1,948-69 ft. TD 2,000 ft. Opens North Blackland field.

Wayne County:

Paul W. McElyrea-Jet Oil Co. 1 Vest Heirs, SW NW SW 26-1n-5e. IP 135 BOPD, Aux Vases 2,885-2,994 ft. TD 2,950 ft.

KENTUCKY

Hancock County:

Arthur and Richard Case 1 R. G. Hidgden "A," 9-R-32. IP 18 BOPD, 3 BWPD, Tar Springs 469-482 ft. TD 491 ft. Opens East Lewis Fork field.

KANSAS

Chautauqua County:

Pure Oil Co. 1 Jarboe, NW NW SW 12-32s-8e. IP 4,500 M.c.f.d., Layton 1,459-61, 1,465-72 ft. TD 1,723 ft. Opens Coach Lines field.

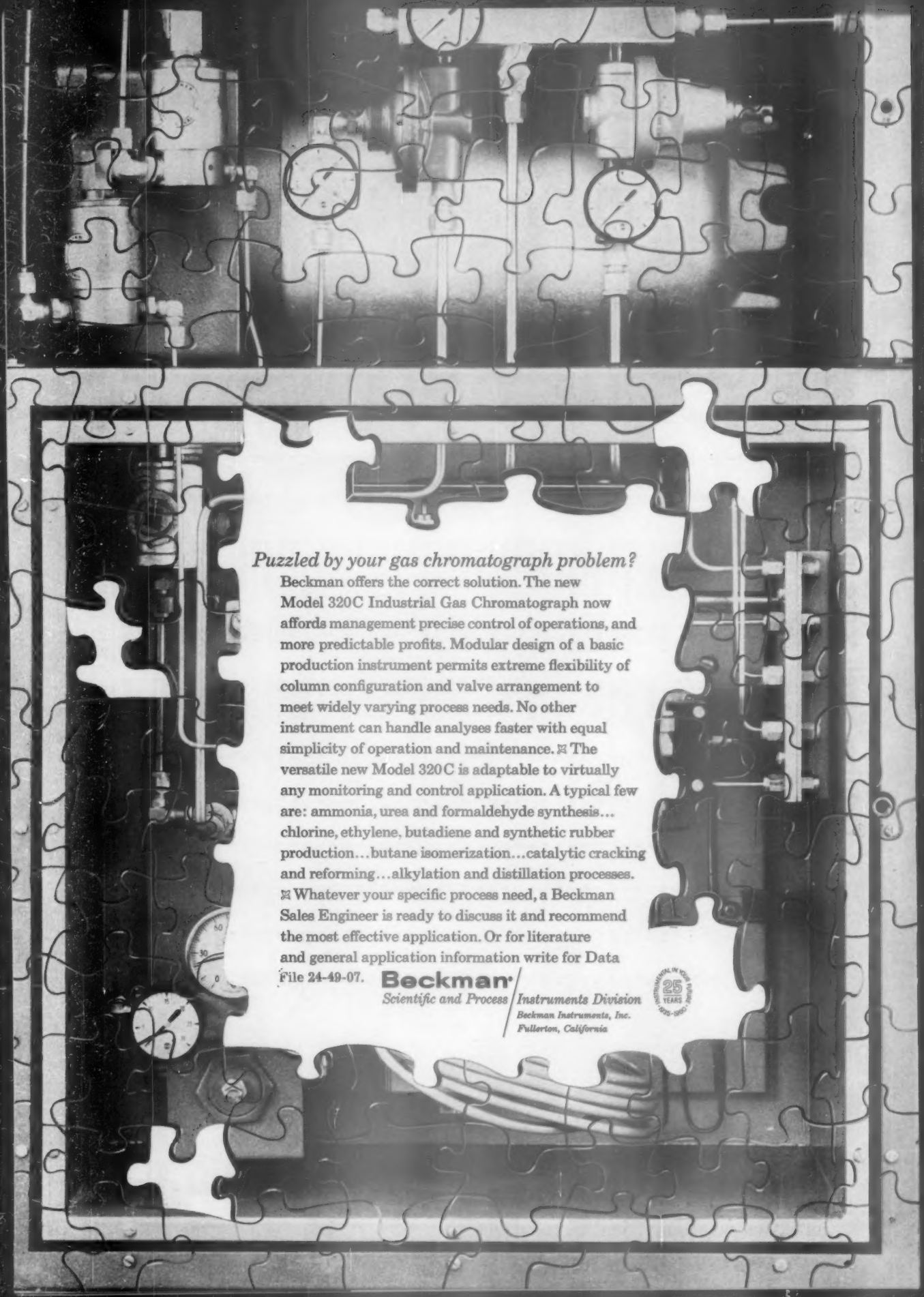
Cowley County:

Gearhart-Canaday 1 Smith, SW SW SE 26-31s-3e. IP 50 BOPD, 20 BWPD, 40°, Layton 2,480-84, 2,497-2,500 ft. TD 3,085 ft.

October's well score in the U. S.

State—	Total completions: Total	Oil	Cond.	Gas	Dry	Service	Footage	Cum. wells 1960	Cum. footage 1960	Cable-tool comp.	D.D.	Wildcats: Total	Oil	Cond.	Gas	Dry	Footage	Cum. wells 1960	Cum. footage 1960
Alabama	6	4	0	0	2	0	68,776	39	413,820	0	1	2	0	0	0	2	22,851	4	26,368
Alaska	1	0	0	0	1	0	3,013	13	136,587	0	0	1	0	0	0	1	3,013	6	64,095
Arizona	1	0	0	0	1	0	5,799	27	61,568	0	0	1	0	0	0	1	5,799	19	44,134
Arkansas	53	29	0	2	22	0	175,884	498	1,802,916	0	0	7	0	0	0	7	19,923	127	490,227
California	148	103	1	7	37	0	590,086	1,354	6,155,371	0	10	18	1	0	2	15	171,800	252	1,471,567
Colorado	51	7	1	10	33	0	258,413	527	2,598,110	0	1	32	1	1	1	29	170,936	272	1,351,666
Florida	0	0	0	0	0	0	0	4	46,332	0	0	0	0	0	0	0	0	4	46,332
Idaho	1	0	0	0	1	0	1,182	1	1,182	1	0	1	0	0	0	1	1,182	1	1,182
Illinois	199	64	0	0	80	55	413,553	1,905	3,854,350	*26	10	45	8	0	0	37	82,740	403	751,266
Indiana	95	19	0	0	71	5	136,595	878	1,202,270	*71	3	35	3	0	0	32	39,210	320	392,062
Iowa	0	0	0	0	0	0	0	4	4,277	0	0	0	0	0	0	0	0	4	4,277
Kansas	399	197	0	27	143	32	1,080,224	3,298	10,113,155	118	0	87	11	0	6	70	323,439	874	3,233,632
Kentucky	220	86	0	27	107	0	282,882	1,770	2,368,379	*190	0	51	14	0	4	33	62,206	186	268,189
Louisiana	342	157	33	24	128	0	2,478,898	3,001	23,661,905	0	0	57	5	4	1	47	468,369	467	4,005,343
North	146	52	0	24	70	0	549,933	1,145	4,406,603	0	0	27	4	0	1	22	150,023	222	1,151,763
South	155	85	23	0	47	0	1,506,343	1,141	14,808,700	0	0	27	1	3	0	23	284,562	217	2,494,148
Offshore	41	20	10	0	11	0	422,622	415	4,446,602	0	0	3	0	1	0	2	33,784	28	359,432
Michigan	90	36	0	4	49	1	327,792	770	2,608,186	41	0	28	1	0	0	27	115,000	208	779,250
Mississippi	53	21	7	1	24	0	545,813	568	5,704,224	0	1	20	3	0	1	16	210,835	217	2,121,431
Missouri	0	0	0	0	0	0	0	27	44,639	0	0	0	0	0	0	0	0	27	44,639
Montana	37	14	0	1	21	1	155,223	274	1,298,216	2	0	17	1	0	1	15	62,806	128	532,845
Nebraska	84	18	0	0	66	0	447,144	734	4,053,694	0	1	52	1	0	0	51	279,121	318	1,708,667
Nevada	0	0	0	0	0	0	0	3	11,762	0	0	0	0	0	0	0	0	3	11,762
New Mexico	148	78	0	37	28	5	736,004	1,553	7,633,972	32	0	9	0	0	0	9	18,991	220	1,098,213
West	63	15	0	35	8	5	346,360	552	2,578,858	9	0	3	0	0	0	3	3,463	61	217,058
East	85	63	0	2	20	0	389,644	1,001	5,055,114	23	0	6	0	0	0	6	15,528	159	881,155
New York	18	8	0	0	3	7	22,770	255	438,273	18	0	0	0	0	0	0	0	39	137,400
North Carolina	0	0	0	0	0	0	0	3	4,896	0	0	0	0	0	0	0	0	3	4,896
North Dakota	23	13	0	0	10	0	150,372	248	1,585,438	0	0	8	1	0	0	7	58,284	68	407,225
Ohio	92	39	0	18	24	11	252,807	882	2,199,795	90	0	6	0	0	1	5	20,887	44	154,845
Oklahoma	360	181	3	25	88	63	1,150,643	3,814	14,316,220	98	0	38	12	1	0	25	225,053	591	3,046,107
Oregon	0	0	0	0	0	0	0	7	16,685	0	0	0	0	0	0	0	0	7	16,685
Pennsylvania	71	20	0	19	9	23	204,725	741	2,085,663	65	7	3	0	0	0	3	17,650	18	109,218
South Dakota	1	0	0	0	1	0	5,158	19	127,912	0	0	1	0	0	0	1	5,158	8	33,616
Tennessee	12	2	0	1	9	0	8,419	78	62,999	12	0	12	2	0	1	9	8,419	74	61,780
Texas	1,223	599	71	58	461	34	4,984,975	12,992	55,444,958	61	17	264	24	3	2	235	1,146,526	2,683	12,137,757
District 1	114	62	2	2	48	0	289,713	929	2,514,221	3	1	34	0	0	0	34	86,624	338	1,004,279
District 2	59	11	11	13	24	0	401,324	633	4,197,447	0	2	14	2	0	1	11	105,074	156	1,102,209
District 3	96	38	12	1	45	0	699,970	986	6,914,293	0	1	20	2	0	0	18	203,940	187	1,707,376
District 4	77	23	13	7	31	3	414,594	888	4,901,581	0	1	19	1	3	0	15	122,858	248	1,413,430
East (5 & 6)	100	53	5	1	39	2	477,545	1,060	4,967,982	0	0	26	0	0	0	26	120,801	224	1,225,056
District 7-B	149	73	2	3	69	2	465,986	1,868	5,290,743	0	3	40	6	0	0	34	139,618	527	1,590,754
West (7-C & 8)	254	170	9	6	61	8	1,192,757	3,322	16,617,066	18	3	42	7	0	1	34	193,106	517	2,360,743
District 9	265	122	5	2	125	11	588,883	2,432	6,090,334	40	3	63	6	0	0	57	130,426	436	1,339,453
District 10	109	47	12	23	19	8	454,203	874	3,951,291	0	3	6	0	0	0	6	44,079	50	394,457
Utah	17	6	0	0	11	0	92,793	193	1,089,089	0	0	10	0	0	0	10	53,919	72	409,779
Virginia	8	0	0	8	0	0	39,584	8	39,584	8	0	0	0	0	0	0	0	0	0
Washington	2	0	0	0	2	0	16,775	4	26,515	0	0	2	0	0	0	2	16,775	4	26,515
West Virginia	126	15	0	88	18	5	275,575	738	1,794,789	124	0	2	0	0	1	1	12,643	8	58,706
Wyoming	97	43	0	6	48	0	458,404	873	4,331,103	4	3	41	2	0	1	38	171,214	358	1,888,494
Total October 1960	**3,978**	**1,759**	**116**	**363**	**1,498**	**242**	**15,370,281**	**38,103**	**157,338,834**	**961**	**54**	**850**	**90**	**9**	**22**	**729**	**3,794,749**	**8,037**	**36,940,170**
Total September 1960	3,914	1,627	107	361	1,406	413	14,392,006	.....	.....	1,189	68	724	70	7	37	610	3,165,492	....	.....
Cumulative 1960	**38,103**	**17,123**	**1,108**	**3,174**	**14,510**	**2,188**	**157,338,834**	.....	.....	**7,526**	**508**	**8,037**	**723**	**87**	**272**	**6,955**	**36,940,170**	....	.....
Cumulative 1959	41,935	20,797	1,030	3,142	15,786	1,180	174,081,931	.....	.....	....	....	8,202	730	93	281	7,098	39,826,361	....	.....

*Estimated.



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▶▶▶ Personals

Dr. Jerry McAfee, vice president, engineering, for Gulf Oil Corp.'s manufacturing department, has been named to the new post of vice president, executive technical adviser. McAfee joined Gulf in 1945 as technical specialist at the Port Arthur, Tex., refinery. He was transferred to Gulf Research & Development Co. at Harmarville, Pa., in 1950. He was director of the chemistry division, assistant director of research, and vice president and an associate director of research for Gulf Research & Development before being elected a vice president of Gulf Oil in 1955. McAfee is also a director of Goodrich-Gulf Chemicals, Inc., Neches Butane Products Co., Callery Chemical Co., and United Petroleum Securities, Ltd. He is current president of American Institute of Chemical Engineers.

Dr. P. R. Ryason has been promoted to senior research chemist in the petroleum-products research section of California Research Corp.'s Richmond, Calif., laboratory. New research chemists at the Richmond lab include: **Dr. Shigeto Suzuki, Dr. Donald J. Anderson, Dr. William H. Richardson, Vernon E. Summerfelt, Dr. Patrick H. Hess, Dr. Thomas V. Liston, Dr. Eugene D. Vessel, Dr. David J. MacDonald, Dr. Harris E. Kluksdahl, Dr. E. P. Antoniades, Robert Bacskai, Dr. Richard W. Fish,** and **Dr. Arnulf Vollmar.** New research engineers, Richmond, are: **Bobby G. Calhoon, Eugene W. Madison, Elmore F. Chilton, Anthony E. Pepe, Ellen M. Mauer, Robert L. Norman, Morton Orentlicher, Ben G. Bray,** and **Lester A. Wanninger, Jr. Charles L. Rimpley** and **Gilbert J. P. Chun** have been named research mathematicians, Richmond. At Cal Research's La Habra, Calif., laboratory, **John K. Adair, Jr., David L. Hill, John D. Myers,** and **Aristide Rosman** have been named research engineers. **Dr. Concetto R. Giuliano** has been appointed research chemist, La Habra. **John C. Graham** has been named research engineer in El Segundo, Calif.

John L. Chadwick, Delhi-Taylor Oil Corp., has been named vice chairman of the Dallas section, American Institute of Chemical Engineers. **Norman V. Stone,** Lone Star Gas Co., has been elected treasurer of the group.

Fletcher F. Farrar, Mount Vernon, Ill., has been elected president of the Illinois Oil and Gas Association, succeeding **Howard L. Brockman,** Olney. Other new officers are: **J. D. Anderson,** Terre Haute, Ind., first vice president; **J. J. Shulman,** Vandalia, second vice president; **R. C. Cooper,** Olney, third vice president; **T. F. Lawry,** Robinson, secretary; and **W. B. Price,** Mount Vernon, treasurer. **C. T. Smith,** Flora, was reappointed general counsel and **Charles J. Pardee,** Mount Vernon, was reappointed executive secretary.

King B. Burton has joined Monsanto Chemical Co.'s Lion Oil Co. division in El Dorado, Ark., as assistant manager of gasoline and fuel-oil sales. **Theodore S. Klein** and **Bernard J. Patnode** have joined the production technical-service department of Monsanto's plastics division in Springfield Mass.

Donald T. Metcalfe, gas-plant operator for Sun Oil Co. in Laverne, Okla., has joined Transwestern Pipeline Co. as gas-measurement technologist in Perryton, Tex.

Harold J. Hewett, Jr., has been appointed market analyst on sales and distribution for Transwestern Pipeline Co. Hewett recently returned from 2 years in Buenos Aires, where he was with Sargo S.A. Oleoductos y Gasoductos working with construction of natural-gas and products pipelines for the Argentine Government. Hewett entered the gas-pipeline field with Tennessee Gas Transmission Co., where he assisted in initial development of gas markets for Midwestern Gas Transmission Co., an affiliate of Tennessee Gas. He also has been with Fish Service Corp.

A. C. Martinsen has been appointed executive vice president and general manager of Catalytic Construction of Canada, Ltd., a subsidiary of Catalytic Construction Co. of Philadelphia. Martinsen has been with the Philadelphia company since 1952 as manager of engineering.

David S. Sheridan, district geologist for Texaco Inc., has been transferred to Corpus Christi, Tex., from Tyler, Tex.

J. M. Whelan, American Oil Co., has been elected president of the Transportation Club of the Petroleum Industry. He succeeds **W. D. Ohle,** Sinclair Refining Co., who has been named vice chairman of the board. Other officers are: **J. P. Dennis,** Texaco Inc., first vice president; **Ralph L. Andreas,** Standard Oil Co. (Ind.), second vice president; **Raymond R. Hooper,** Consolidated Freightways, Inc., secretary-treasurer; and **J. R. Lewallen,** Anderson - Prichard Oil Corp., chairman of the board.

Dr. John E. Kircher, executive assistant to the senior vice president of Continental Oil Co., has been promoted to general manager of the southwestern region in Fort Worth. He succeeds **W. O. Ham, Jr.,** who recently was elected a vice president and transferred to Houston as general manager of the domestic exploration department. Kircher joined Conoco in 1951 as manager of the petrochemical department. He was named general manager of the petrochemical department in 1956 and executive assistant to the senior vice president in 1958. He was with Sharples Chemical Co., Sharples-Continental Corp., and Stepan Chemical Co. before joining Conoco.

KIRCHER

William Y. Brown has been named manager of petroleum operations in Creole Petroleum Corp.'s western division. **Robert N. Dolph** has been named assistant manager of petroleum operations and **Donald H. Bancroft** has been appointed manager of industrial operations in the western division. **H. B. Hegglund** continues as division manager. **Capt. D. O. Henry** has been appointed head of Creole's marine department. He succeeds **Capt. J. S. Kyle,** who has retired after 40 years of service.

Petrochemicals department headquarters of American Cyanamid Co. will be moved December 5 from New York to Bound Brook, N. J. Making the move will be **T. D. Smith,** department manager; **L. G. Tompkins,** technical manager; **E. C. Hallberg,** technical representative; **J. M. McNamee,** sales manager; and **G. E. Brendel,** supervisor of order processing.

George C. Bond has been named assistant to the chairman of Union Oil Co. He will headquarter in Los Angeles.

Personals

Dallas R. Lamont, vice president of research for Socony Mobil Oil Co., Inc., has been elected senior vice president in charge of research and engineering. In addition to research, he will be responsible for the engineering and operations-analysis, process-promotion, and products departments. Lamont succeeds **Arthur V. Danner,** who recently was named president of the new Mobil Petroleum Co. and an executive vice president of Socony Mobil. Lamont and Danner will continue as Socony Mobil directors.

LAMONT

Elwood I. Clapp, Jr., formerly with American Cyanamid Co., has joined SunOlin Chemical Co. as technical economist. **Bernard J. Williams,** project engineer with Brown & Root, Inc., has joined SunOlin as mechanical engineer, and **Charles J. Paulus,** maintenance and construction engineer with Gulf Oil Corp., has joined SunOlin as plant engineer. They will work with plans for SunOlin's ethylene and ethylene oxide plant now under construction at Claymont, Del.

L. C. Kemp, Jr., vice president of Texaco Inc. in New York, has been elected a vice president of United Engineering Trustees, Inc., organization of five national engineering societies. Kemp represents the American Institute of Chemical Engineers. **Michael L. Haider,** New York, vice president and a director of Standard Oil Co. (N. J.), has been elected a trustee of United Engineering. He will represent the American Institute of Mining, Metallurgical, and Petroleum Engineers.

A. J. Romeril has been named superintendent of engineering services, a new post at Monsanto Chemical Co.'s Texas City plant. He will be responsible for inspection and corrosion activities, plant-engineering design, and the instrument department. Romeril has been in charge of maintenance in the Texas City polyethylene plant for the past year, and was assistant plant engineer before that time.

Donald A. High, research chemical-engineer for Monsanto Chemical Co. in Dayton, Ohio, has been named a research group leader in the research and engineering division, Dayton.

Operations of Cactus Petroleum, Inc., Houston, and Permian Corp., Midland, Tex., have been merged. **W. R. Davis,** president of Permian, will be president of the combined company. Cactus will operate as a division of Permian. **W. D. York,** president of Cactus, has been elected a director of Permian. **T. D. Jenkins** and **Ed S. Brooks,** formerly with Cactus in Houston, have been elected vice presidents of Permian. Other Permian vice presidents are **M. W. Sublett,** Houston; **W. L. Kleine,** Midland, and **George O. Nolley,** Tulsa.

W. P. G. Maclachlan has been appointed general manager of Burmah Oil Co. (Pakistan Trading) Ltd., and a director of Pakistan Petroleum, Ltd., Sui Gas Transmission Co., Karachi Gas Co., Indus Gas Co., and Pakistan Refinery. As general manager of Assam Oil Co., Ltd., his previous post, Maclachlan represented the Burmah group's interests in India.

William H. Sloan has been appointed general manager of a new natural-gas liquids company in Calgary, which is being organized by Canadian Hydrcarbons, Ltd. Name of the new company was not announced. Sloan will be in charge of buying, selling, transportation, and storage of natural-gas-liquid products for the new company, which will be a wholly owned subsidiary of Canadian Hydrocarbons.

Dr. John J. Stanko has been named vice president of asphalt and fuels for Douglas Oil Co. of California and general manager of United Asphalt Co. Stanko has been vice president in charge of industrial asphalt sales and research and development projects for Douglas. His former duties will be combined with asphalt road-oil sales to form a single department.

Marion T. Friday, party chief for Atlantic Refining Co. in Dallas, has joined Texaco Inc. in Midland, Tex., as seismic interpreter.

John J. Zullo has been appointed plant manager of American Chemical Corp.'s Long Beach, Calif., plant. He had been assistant manager of the Niagara Falls plant. American Chemical is a subsidiary of Stauffer Chemical Co. and Richfield Oil Corp.

Claude V. Barrow, veteran oil editor of the Daily Oklahoman and Times, Oklahoma City, will retire early next year. He will be succeeded by **L. D. (Deacon) New,** formerly district editor with The Oil and Gas Journal in Tulsa.

Jerry R. Jax, district gas engineer for Lake Superior Oil Co. in Lake Arthur, La., has been transferred to Houston as senior gas engineer.

M. Bruce Lawler, research engineer at California Research Corp's Richmond, Calif., laboratory, has been given a loan assignment as financial analyst with Standard Oil Co. of California, the parent company.

William E. Walls, gas tester for Atlantic Refining Co., has been transferred to Magnolia, Ark., from Oklahoma City.

A. W. Andrews, associate director of engineering for Monsanto Chemical Co. in Springfield, Mass., has been named director of engineering for the plastics division. Andrews has been with Monsanto since 1941.

Hy Yellin and **Charles Shelton, Jr.,** have formed International Pipeline Associates, pipeline consulting firm, in

YELLIN

SHELTON

Dallas. Yellin formerly was chief engineer of Pipe Line Engineering Co. Shelton is a former pipeline adviser to Esso Standard (Libya), Inc., Bengasi, Libya, and was at one time chief pipeline engineer in Tia Juana, Venezuela, for Creole Petroleum Corp.

C. E. Porterfield has joined the University of Oklahoma's business and industrial services, extension division, as a specialist in petroleum services. He formerly was engineer with R. L. Hoss, Denver independent, and had been with Monsanto Chemical Co.'s Lion Oil division in Denver.

Dr. E. S. Cohen, Esso Research & Engineering Co., has been given a 1-year rotational assignment with Jersey Production Research Co. in Tulsa. He will be a section head in new methods, production division. **Dr. G. G. Binder, Jr.,** also a section head in new methods for Jersey Production, will continue in this position.

J. H. Johnson, supervisor of budget control and profit analyses in the Kansas City regional office of Standard Oil Co. (Ind.), has been transferred to Chicago as research associate in the marketing-research department.

COOKE

John T. Cooke, manager of foreign operations for Sohio Petroleum Co., has been named manager of exploration activities in Canada. He succeeds **W. C. MacQuown, Jr.,** who has left the company to go into business for himself. Cooke will move to Calgary from Oklahoma City. He has been with Sohio since 1947.

Bill L. Presson, production engineer with Cities Service Oil Co. in Great Bend, Kans., has been transferred to Bartlesville, Okla., where he will be production engineer in the computer section, production department.

W. H. Van Hook, senior production engineer for Mobil Oil Co. in Lafayette, La., has been named sales representative in Houston for Mobil Chemical Co.

P. A. Ostermayer has been promoted to staff engineer in the process-technical division at Humble Oil & Refining Co.'s Baytown, Tex., refinery.

David E. Simmons, geological trainee with Phillips Petroleum Co. in Bartlesville, Okla., has been transferred to Lafayette, La., and promoted to development geologist.

John Sicking, head of a technical-services group for Jersey Production Research Co. in Tulsa, has accepted a 1-year assignment as senior petroleum engineer for Esso Standard (Libya), Inc., in Bengasi, Libya.

Thomas C. Woodward, formerly with Gulf Oil Corp. and Pan American Petroleum Corp., has opened offices in Casper, Wyo., as consulting geologist.

Charles E. Stewart, engineer on the Federal Power Commission staff, has been transferred to Oklahoma City from Omaha, Neb.

A. B. McClelland, Jr., president of Texam Oil Corp., Three Rivers, Tex., has been named president of Suntex Petroleum, Ltd., Calgary, a subsidiary formed by Texam to manage its Canadian exploration and production activities. **John A. Murphy,** executive vice president of Texam, has been named executive vice president of Suntex.

J. W. White, project-engineering group head at Humble Oil & Refining Co.'s Baton Rouge refinery, has been transferred to the petroleum products division as division foreman in the cracking and hydroforming department.

Tommy D. Ables, Ada, Okla., consulting engineer, has joined Rock Island Oil & Refining Co., Inc., in Wichita as production engineer.

F. T. Bethel, division reservoir engineer for Shell Oil Co. in Denver, has been transferred to New York as exploitation engineer in the exploration and production - economics group.

Jack L. Stanford, Panhandle district geologist for British - American Oil Producing Co., has been transferred to Oklahoma City from Amarillo, Tex., in a relocation of district offices.

John C. Kinard, geologist with Phillips Petroleum Co., has resigned to open consulting offices in Billings, Mont.

William E. Fickert has been named manager of the new Midland, Tex., office of Ryder Scott Co. Petroleum Engineers and Ryder Scott Management Co., Wichita Falls, Tex.

Alfonzo Mario Escalante, field geologist with Union Oil Co. in Buenos Aires, Argentina, has been transferred to Los Angeles.

James N. Landis, vice president of Bechtel Corp., has been elected president of Engineers Joint Council, federation of 21 engineering societies. He succeeds **Augustus B. Kinzel,** vice president of Union Carbide Corp. **George E. Holbrook,** vice president of Du Pont, has been reelected vice president of the council.

Jack L. Battle, senior petroleum engineer for Humble Oil & Refining Co., has been named president of the San Jacinto chapter of Texas Society of Professional Engineers.

Personals

E. L. Hemming, general manager of Gulf Oil Corp.'s Philadelphia sales division, has been appointed vice president of sales for Wilshire Oil Co. of California, a Gulf subsidiary. Hemming has been with Gulf since 1933. He had served as Cincinnati district manager, division manager of retail and jobber sales in Toledo, and coordinator of retail and jobber sales in Pittsburgh before becoming general manager in Philadelphia.

Wilbert B. Dubin, retail marketing manager for Tidewater Oil Co.'s western division, has been appointed division marketing manager. He succeeds **Donald T. Whalen,** who recently was named national marketing manager.

Dr. Jesus Antonio Rojas has been appointed general manager attached to the western division of Cia. Shell de Venezuela. He succeeds **T. Forgan,** who has been transferred to the London offices of Royal Dutch-Shell.

A. D. Turquette has resigned as geologist with Southwood Exploration Co., Inc., in Denver to join the U. S. Bureau of Mines in Laramie, Wyo.

Bob Stephenson, Pure Oil Co. geologist, has been transferred to Oklahoma City from Ardmore, Okla.

William V. Hannigan, geologist with Tennessee Gas & Oil Co., has been transferred to Oklahoma City from Wichita Falls, Tex.

William D. Hanus has joined Shell Chemical Co.'s technical service laboratory in Union, N. J., as chemist.

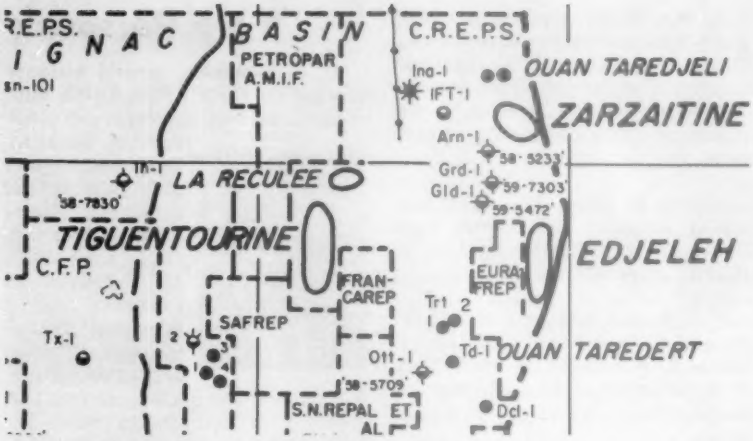
W. E. Moore, district land man with Amerada Petroleum Corp., has been transferred to Wichita from Jackson, Miss.

Deaths

Fred Ratcliff, 66, superintendent of the Houston branch of Russell Maguire Oil Co., New York, died November 8 in a Jacinto City, Tex., hospital.

Claude Cecil McSpadden, 76, Houston independent operator, died November 18 in a San Antonio, Tex., hospital after a long illness. McSpadden, who set up his own company in Houston in 1928, was one of the first operators to enter Louisiana's Weeks Island oil boom.

Donald Edward Ball, 58, civil engineer with Southern California Gas Co., died November 11 in a Los Angeles hospital.



Map book of Africa, Middle East is made available by Los Angeles firm

A comprehensive map book covering petroleum developments in Africa and the Middle East has just been completed by Munger Oil Information Service, Los Angeles map and oil-reporting firm, 5865 West Blvd., Los Angeles 43.

The 115-page book covers all countries in the two areas. Included is a concession map of the countries showing fields and wells along with an overlay which shows the geology of the country. There also are several area and field maps which spotlight established producing areas.

A. H. Munger, manager of the Munger organization, and E. Placidi compiled the book. The geological information was handled by Edward A. Gribi, Jr., geologist with Westates Petroleum Co., Los Angeles.

Some areas which are getting the biggest play in the foreign hunt for oil are covered in the new Munger book. Included are such countries as the Spanish Sahara, Libya, Algeria, and other African countries where companies have just begun to step up their exploration programs.

The African and Middle East book will be included in a world-wide map book.

More discovery wells

KANSAS

Ellsworth County:
Kansas Petroleum Co. 1 Kanak, C NE SW 15-16s-7w. IP 500 M.c.f.d., Indian Cave 1,767-68 ft. TD 1,850 ft. Shut-in gas well.

Grant County:
Hugoton Production 2-36 Jarvis, C N½ 36-30s-38w. IP 5,609 M.c.f.d., Council Grove 2,800-2,941 ft. TD 6,060 ft. Gas discovery.

Hamilton County:
Mayflo 1-21 Howell, C SE SE 21-21s-41w. IPF 1,400 M.c.f.d., Winfield 2,770-85 ft. TD 2,847 ft.

Kingman County:
Drillers Production 2 Hurn, C SE¼ 28-27s-5w. IP 1,642 M.c.f.d., Mississippian dolomite 3,782-90, 3,784-92, 3,786-94 ft. TD 3,796 ft. Opens Hurn pool.

Morton County:
Cities Service Oil Co. 2 French "A," C SE NW 12-32s-40w. IPF 7 M.M.c.f.d., Morrow 5,674-5,798 ft. TD 6,176 ft.

Pratt County:
Frontier Oil Co. 1 Flora, C SE SW 24-29s-13w. IP 78 BOPD, 31 BWPD, Lansing 3,966-74, 4,110-15 ft. TD 4,736 ft.

Saline County:
Don McKeller 1 Jackman, NE SE NE 10-15s-1w. IP 25 BOPD, 73 BWPD, Miss. 2,547-54 ft. TD 2,554 ft. Opens Jackman pool.

Scott County:
Imperial Oil Co. of Kansas 1 Newby, C SE SW 23-18s-32w. IP 129 BOPD, 28.1°, Lansing 3,958-60 ft. TD 4,875 ft. Opens Newby pool.

Seward County:
Petroleum Inc. 1 Dolven, C SW 1-32s-32w. IP 389 M.c.f.d., Morrow 5,572-78, 5,600-08 ft. TD 594 ft. New field.
Falcon-Seaboard Drilling Co. 1 Peters, C NE SW 15-33s-33w. IP 40,598 M.c.f.d., Morrow 5,680-5,700 ft. TD 6,471 ft. New field.

Sumner County:
Don Slawson 1 Holman, SW SW NE 26-33s-2e. IP 170 BOPD, Miss. 3,306-12 ft. TD 3,361 ft.

MONTANA

Roosevelt County, Tule Creek:
Murphy Corp. 1 E. O. Sletvold, C SE SE 18-30n-48e. IPF 476 BOPD, 0.1% b.s. and w., 14/64-in. choke, 42°, GOR 246:1, TP 340 psi. Nisku Devonian 7,660-92 ft. TD 8,470 ft. Devonian discovery, new field. PBTD 7,912 ft.

NORTH LOUISIANA

Bossier Parish:
D. P. Magouirk 2 R. Z. Beidenharn et al., 23-21n-14w, 3 miles northeast of Cavett. IP 100 M.c.f.d., 2 BCPD, 50 BWPD, 1-in., shut-in TP 285 psi., perf. 1,008-10 ft. Nacatoch, TD 1,118 ft. New-pool discovery west of Cottage Grove field.
D. P. Magouirk 4 R. Z. Beidenharn et al., 28-21-14w, 1 mile southeast of Cavett. IP 240 M.c.f.d., dry gas, 1¼-in. choke, shut-in TP 260 psi., open hole 910-24 ft., Nacatoch. TD 924 ft. New-pool discovery west of Cottage Grove field.

Union Parish:
Pure Oil Co. 1-B Olin, SW SW SW NE 1-22n-1w, IPP 9 BOPD (net), 94% b.s. and w., 36.4°, perf. 2,136-44 ft., Nacatoch. TD 2,190 ft. Extends Ora field 1½ miles northeast.

SOUTH LOUISIANA

St. Landry Parish:
Amerada Petroleum Corp. 1 Ned A. Pellerin, 58-7s-3e, 2½ miles southeast of Lawtell field. IP 2,467 M.c.f.d., 84 BOPD, 12/64-in., TP 2,100 psi., perf. 10,902-22 ft. TD 13,213 ft. New-field discovery.

Terrebonne Parish:
Shell Oil Co. 1 Mable Hebert, 26-18s-18e. IP 4,760 M.c.f.d., 170 BOPD, 10/64-in., 48.1°, TP 8,225 psi., perf. 13,587-13,628 ft. TD 14,000 ft. Extends Cauvin field 1½ miles south.
Bateman Drilling Co. 1 Continental Land & Fur Co., 51-17s-15e. IP 2 M.M.c.f.d., 4 BOPD, 10/64-in, 48°, TP 3,850 psi., perf. 10,698-10,707 ft. TD 12,082 ft. New-reservoir discovery ¾ mile northwest of South Humphreys field.

NEBRASKA

Banner County:
Edward Mike Davis 1 Nelson, C SW SE 2-17n-56w. IPP 200 BOPD, "J" sand discovery, new field. TD 6,655 ft. "J" sand 6,583-66 ft.

Kimball County:
Chandler & Simpson-Petroleum, Inc. 1 Bourlier-C, C SW NE 10-13n-57w. IPP 237½ BOPD, cut 5-6% water, "J" sand 7,004-18 ft. TD 7,045 ft. "J" sand discovery, new field in Denver basin.
Chandler & Simpson-Petroleum, Inc. 1 Haug, C SE NW 6-12n-57w. IPP 22 BOPD, cut 16% water, "J" sand 7,057-61 ft. TD 7,084 ft. "J" sand discovery, new field.

Redwillow County:
Franco-Central Oil Co. 1 J. R. Fritz, C NW NW 1-2n-27w. IP 95 BOPD, 30°, Basal Penn-Reagan Cambrian 3,517-24 ft. TD 3,552 ft. New field.

OKLAHOMA

Cleveland County:
Petroleum Inc. 1 Crowder "A," C NE NE 14-9n-3w. IP 240 BOPD, Second Wilcox 9,634-44 ft. TD 10,486 ft.

Garfield County:
Texas Eastern Transmission Corp. 1 Goff, SW SE 14-20n-8w. IP 15 BOPD, Manning 6,920-34 ft. TD 8,354 ft.

Jefferson County:
G. C. Parker 1 Stone, C NE NE 25-5s-4w. IP 40 BOPD, 39°, 35°, Bois d'Arc-Hunton 8,914-86, Chimney Hill 9,254-87 ft. TD 9,301 ft.

Lincoln County:
Apache Oil Corp. 1 Elsey, SW SW NE 30-14n-2e. IP 100 BOPD, 600 BSWPD, 38°, Hunton 5,243-44 ft. TD 5,618 ft.

Texas County:
T. K. Hendrick 1 Heatley, C SE NW 24-6n-11eCM. IP 16,979 M.c.f.d., Topeka 3,180-92 and 3,247-78 ft. TD 3,332 ft.

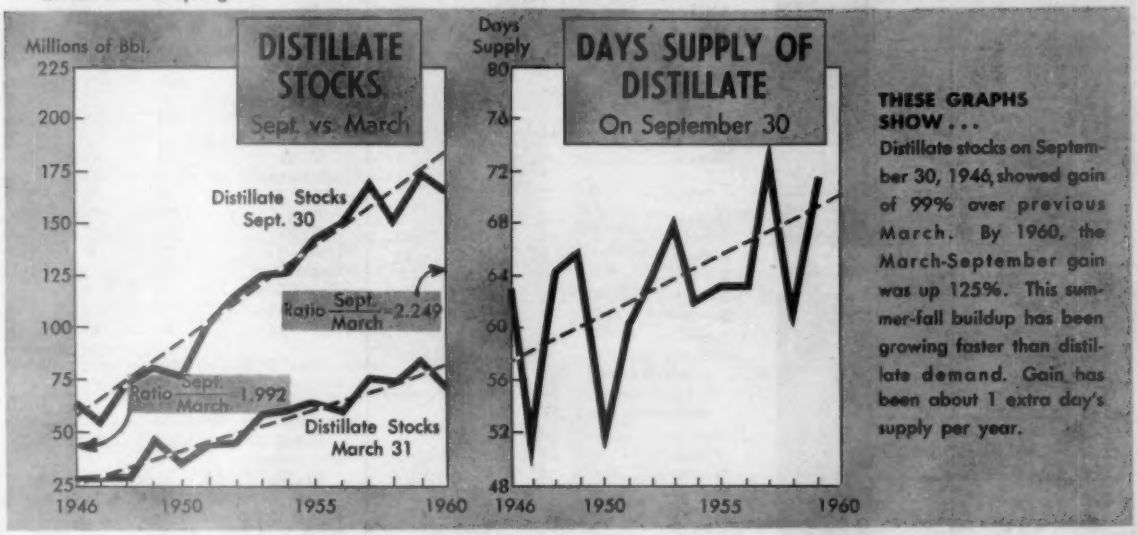
WYOMING

Crook County:
Rio Oil Co.-Continental Oil Co. 1 Federal-Lewark, C SW NW 6-53n-68w. IPP 271 BOPD, 37.7°, Newcastle 5,307-28 ft. TD 5,692 ft. Newcastle discovery, new field.

Sweetwater County, State Line unit:
Gulf Oil Corp. 8 Unit, NE NE 9-12n-94w. IPF 6,250 M.c.f.d., open flow, Fort Union 4,298-4,316 ft. TD 5,602 ft. PB 4,366 ft. Fort Union discovery, new field.

STOCK SHIFTS: Gains in distillate stocks have been larger in fall than in spring.

RESULT: Fall stocks have grown faster than demand.



THESE GRAPHS SHOW . . . Distillate stocks on September 30, 1946, showed gain of 99% over previous March. By 1960, the March-September gain was up 125%. This summer-fall buildup has been growing faster than distillate demand. Gain has been about 1 extra day's supply per year.

Distillate stocks outpace demand

BY JOHN C. CASPER

REFINERS added more to distillate inventories this past summer than total distillate in storage in the peak month of 1950. Also this distillate stock increase for 1960 was larger than end-of-March stocks at any time in past years.

Here are the figures. Current API reports showed distillate inventories at a little above 168,000,000 bbl. on September 30 this year. The total for the end of March was just under 74,000,000 bbl. The summer buildup amounted to 94,000,000 bbl. The 1950 peak for distillate stocks was 86,113,000 bbl. at the end of November that year. Also, the all-time record for end-of-March inventories was in 1959 when the total amounted to 80,700,000 bbl.

Even though part of the increase in distillate stocks for the past summer can be attributed to the good stock reduction in March, there has been a growing tendency toward rapid increases in distillate inventories during the summer months.

Summer stock growth has shown larger percentage gains than demand. For example, domestic demand for distillate fuel increased 3.2% a year for the period 1955-59. In contrast, distillate stocks increased from 143,248,000 bbl. at the end of September 1955 to 174,148,000 bbl. for September 30, 1959. This represents an over-all gain of 21.57% for the 4-year period or an annual gain of about 5%. Demand gained 3.2% a year but season-starting stocks gained 5%.

This same trend shows up for the whole postwar period. It has been due to rapid stock increases during the summer months. For example, back in 1946, September stocks were 99.2% higher than stocks at the end of March. This year's stock picture shows September stocks 125% higher than the total reported for the end of March.

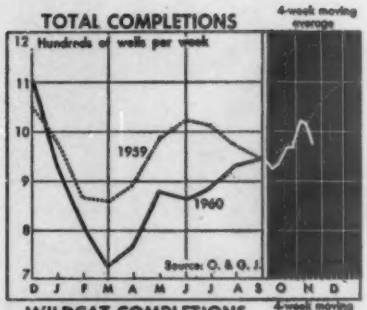
Lack of balance between stock gains and demand gains is illustrated by the second chart. The year-to-year line on this chart gives days' supply of distillate fuel at the end of September. Days' supply was calculated by dividing total distillate stocks on hand at the end of September by daily average demand for distillate during the following winter quarters.

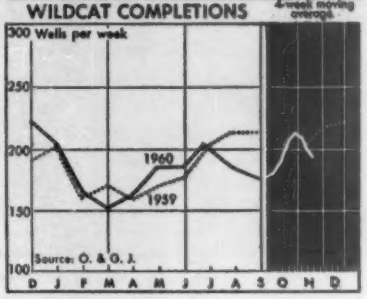
Back in 1946, distillate stocks at the end of September represented 63.2 days' supply, but the ratio dropped to 50.1 days the following year. Since there has been wide variation in days' supply in the postwar period, a trend was calculated for the years 1946 through 1959.

Based on this trend, days' supply of distillate increased from 57.5 in 1946 to 69.1 in 1959. Distillate stocks have been growing faster than demand.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,975,130	UP	3,560	DOWN	16,569
Crude stocks	235,646,000	UP	3,271,000	DOWN	18,302,000
Completions	943	UP	11	DOWN	38
Refinery runs	7,987,000	UP	270,000	DOWN	30,000
Gasoline stocks	184,671,000	UP	1,609,000	UP	7,411,000
Kerosine stocks	36,833,000	UP	604,000	UP	4,863,000
Distillate stocks	175,327,000	DOWN	3,827,000	UP	756,000
Residual stocks	47,963,000	DOWN	761,000	DOWN	8,329,000
Four-product stocks	444,794,000	DOWN	2,375,000	UP	4,701,000
Total imports	1,612,600	DOWN	129,500	UP	30,000





Active Rotary Rigs

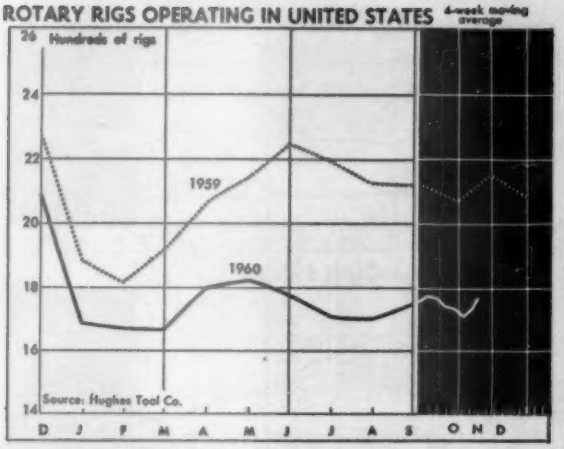
	11-21-60	11-14-60	11-23-59
Alabama	3	3	6
Alaska	8	8	(†)
Arizona	2	2	0
Arkansas	12	14	14
California	72	67	104
Land	69	64	97
Offshore	3	3	7
Colorado	44	46	59
Florida	4	4	1
Land	2	2	1
Offshore	2	2	0
Georgia	1	2	0
Illinois	40	36	42
Indiana	8	12	10
Iowa	0	1	0
Kansas	135	122	159
Kentucky	6	6	11
Louisiana	288	282	321
North	39	33	46
S. Inland waters	103	100	114
S. Land	89	87	106
Offshore	57	62	55
Michigan	30	32	36
Mississippi	49	57	75
Missouri	1	2	1
Montana	22	18	22
Nebraska	23	20	24
Nevada	0	0	1
New Mexico	106	108	126
New York	2	2	0
North Dakota	9	12	26
Ohio	5	5	0
Oklahoma	209	190	248
Pennsylvania	7	5	11
South Dakota	1	1	6
Texas	665	650	778
S. Inland waters	11	12	6
S. Land	181	165	185
Offshore	3	2	3
North	54	43	200
Panhandle	60	61	(*)
East	50	59	(*)
West Central	‡174	177	238
West	132	131	146
Utah	32	28	30
Washington	1	1	1
West Virginia	8	8	5
Wisconsin	1	1	0
Wyoming	64	67	89
Total U. S.	1,858	1,812	2,206
Western Canada	147	151	171
Eastern Canada	0	0	1
Grand total	2,005	1,963	2,378

Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60. ‡Stephens and Eastland counties now included in West Central Texas.

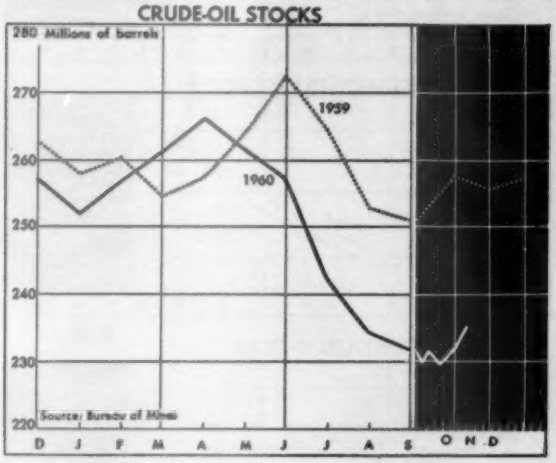
WEEKLY WELL COMPLETIONS . . . WEEK ENDED NOVEMBER 19, 1960

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Arkansas	13	7	0	0	6	0	40,718	541	746	3	0	0	0	3	135	131
California	34	19	0	4	10	1	163,400	1,504	1,375	8	0	0	0	8	274	361
Colorado	20	2	1	5	12	0	117,256	585	685	9	0	0	1	8	295	387
Illinois	58	20	0	0	16	22	119,053	2,069	2,091	8	1	0	0	7	439	355
Indiana	22	6	0	0	16	0	29,843	950	771	8	0	0	0	8	341	263
Kansas	87	43	0	4	35	5	265,077	3,589	3,549	22	2	0	1	19	929	943
Kentucky	124	49	0	32	43	0	179,014	1,940	2,667	15	4	0	1	10	207	323
Louisiana	92	49	9	7	27	0	635,267	3,228	3,366	9	0	0	0	9	497	459
North	43	22	0	7	14	0	136,521	1,255	1,333	5	0	0	0	5	239	206
South	32	15	6	0	11	0	322,812	1,527	1,673	3	0	0	0	3	227	238
Offshore	17	12	3	0	2	0	175,934	446	360	1	0	0	0	1	31	15
Michigan	24	12	0	1	11	0	85,931	843	588	4	0	0	0	4	229	162
Mississippi	11	5	0	0	6	0	101,932	603	574	4	0	0	0	4	223	252
Montana	5	1	0	0	4	0	32,622	303	311	4	0	0	0	4	144	108
Nebraska	21	7	0	0	14	0	115,666	790	802	9	1	0	0	8	344	348
New Mexico	41	15	1	16	9	0	243,077	1,661	1,869	8	2	0	0	6	232	218
West	19	2	1	14	2	0	116,976	600	835	2	0	0	0	2	65	59
East	22	13	0	2	7	0	121,101	1,061	1,034	6	2	0	0	4	167	159
New York	0	0	0	0	0	0	0	282	237	0	0	0	0	0	39	19
North Dakota	6	1	0	0	5	0	36,396	260	392	5	0	0	0	5	75	70
Ohio	21	9	0	3	8	1	59,399	952	971	1	0	0	0	1	45	29
Oklahoma	71	38	0	10	20	3	304,942	4,096	4,810	12	5	0	0	7	630	735
Pennsylvania	0	0	0	0	0	0	0	663	523	0	0	0	0	0	16	19
Texas	272	133	18	17	98	6	1,233,647	13,833	16,667	50	4	1	2	43	2,829	3,134
Dist. 1	9	3	0	2	4	0	25,457	972	966	3	0	0	0	3	350	296
Dist. 2	10	4	0	3	3	0	75,628	669	720	2	0	0	0	2	166	211
Dist. 3	29	9	4	1	15	0	197,775	1,048	1,056	4	0	0	1	3	196	209
Dist. 4	19	8	1	4	6	0	94,081	953	1,199	2	0	0	0	2	262	300
East	26	11	4	0	11	0	134,905	1,162	1,130	7	0	1	0	6	237	218
Dist. 7-B	36	18	0	1	16	1	103,248	1,959	2,322	13	2	0	1	10	556	616
West	69	46	4	0	15	4	365,756	3,554	5,004	10	2	0	0	8	559	680
Dist. 9	52	23	2	0	26	1	135,862	2,582	3,118	8	0	0	0	8	450	508
Dist. 10	22	11	3	6	2	0	100,935	934	1,152	1	0	0	0	1	53	96
Utah	5	3	0	0	2	0	26,631	210	274	2	0	0	0	2	77	78
West Virginia	0	0	0	0	0	0	0	774	694	0	0	0	0	0	9	27
Wyoming	14	2	0	2	10	0	67,276	933	861	10	1	0	1	8	381	312
Misc. (Ala., Ore.)	2	0	0	0	2	0	9,090	241	210	2	0	0	0	2	161	108
Total U. S.	943	421	29	101	354	38	3,866,237	40,850	45,033	193	20	1	6	166	8,561	8,841
Previous week	932	418	22	96	323	73	3,684,881	.....	.....	184	16	4	8	156	.....	.....
Cum. 1960	40,850	18,429	1,181	3,448	15,496	2,296	168,662,844	.....	.....	8,561	778	93	287	7,403	.....	.....
Cum. 1959	45,033	22,467	1,096	3,339	16,870	1,261	185,565,015	.....	.....	8,841	790	98	293	7,660	.....	.....
Western Canada	78	47	0	9	22	0	439,080	2,044	2,142	19	3	0	3	13	534	588

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	11-12-60	11-5-60	11-14-59
Pennsylvania	2,301	2,307	2,526
Other Appalachian	1,400	1,418	1,960
Illinois, Indiana, Michigan	9,046	8,980	10,199
Nebraska and North Dakota	2,936	2,838	3,249
Kansas	9,014	8,784	9,425
Oklahoma	15,430	15,346	15,187
Arkansas	1,878	1,918	2,215
Louisiana	18,096	18,007	18,455
North	2,879	3,066	3,220
South	15,217	14,941	15,235
Mississippi, Alabama, Florida	1,971	1,825	2,171
New Mexico	8,812	8,686	8,272
Texas	98,837	96,682	110,537
East Texas	7,258	7,381	8,266
West Texas	47,156	46,472	53,514
Texas Gulf	17,859	16,828	19,036
Other Texas	26,564	26,001	29,721
Wyoming	15,352	15,149	16,969
Other Rocky Mountain	10,123	9,792	8,990
California	25,955	26,073	28,631
Foreign	†14,495	14,570	15,162
Total	235,646	232,375	253,948

*Bureau of Mines. †Includes 4,976,000 bbl. in California.

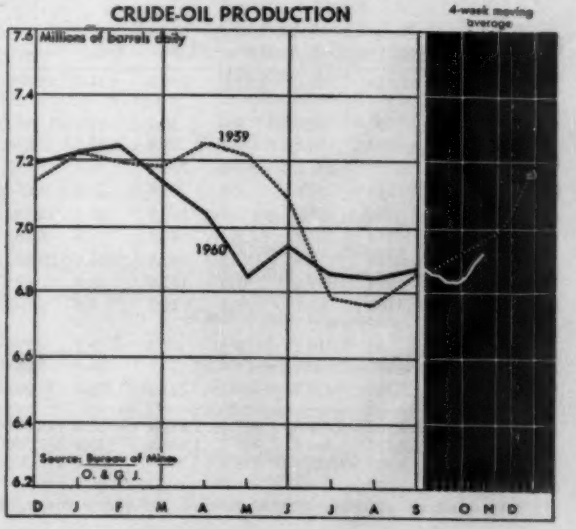
DAILY AVERAGE PRODUCTION FOR WEEK

	November 19, 1960 Crude oil	Lease condensate	Total	Nov. 12 total
Alabama	21,800	.....	21,800	21,700
Arkansas	74,500	50	74,550	77,475
California	832,900	.....	832,900	832,700
Colorado	133,000	.....	133,000	132,660
Eastern	40,100	.....	40,100	40,600
Florida	950	.....	950	950
Illinois	228,100	.....	228,100	221,900
Indiana	32,400	.....	32,400	32,300
Kansas	†308,080	.....	†308,080	†297,535
Kentucky	57,100	.....	57,100	56,700
Louisiana	967,275	132,600	1,099,875	1,100,150
North	105,275	5,100	110,375	110,650
South	862,000	127,500	989,500	989,500
Michigan	47,800	.....	47,800	47,800
Mississippi	145,575	3,950	149,525	149,525
Montana	83,000	.....	83,000	81,800
Nebraska	66,700	.....	66,700	68,400
Nevada	50	.....	50	50
New Mexico	288,000	8,700	296,700	296,700
North Dakota	64,800	.....	64,800	67,150
Oklahoma	†500,100	.....	†500,100	†508,600
Texas	2,373,000	87,200	2,460,200	2,460,200
Dist. 1	43,000	3,200	46,200	46,200
Dist. 2	99,000	8,300	107,300	107,300
Dist. 3	302,000	38,000	340,000	340,000
Dist. 4	170,000	12,200	182,200	182,200
Dist. 5	25,000	500	25,500	25,500
Dist. 6	102,000	9,800	111,800	111,800
East Texas Field	125,000	.....	125,000	125,000
Dist. 7-B	121,000	250	121,250	121,250
Dist. 7-C	115,000	3,050	118,050	118,050
Dist. 8	975,000	9,000	984,000	984,000
Dist. 9	196,000	1,800	197,800	197,800
Dist. 10	100,000	1,100	101,100	101,100
Utah	114,300	.....	114,300	112,425
Wyoming	361,400	.....	361,400	362,600
Others	‡1,700	.....	‡1,700	‡1,650
Total U. S.	6,742,630	232,500	6,975,130	6,971,570
Change from previous week, up			3,560	
Canada	†537,400	.....	†537,400	†481,800

Total U. S. production—Jan. 1-Nov. 12 ..... 2,270,970,300 bbl.
Same period last year (crude plus cond.) .... *2,274,369,000 bbl.

*Includes 60,903,400 bbl. condensate. †Week ended previous Monday. ‡Alaska, South Dakota, and Arizona.

CRUDE-OIL PRODUCTION



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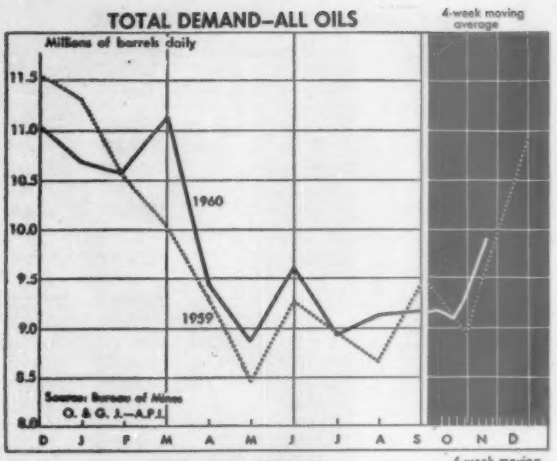

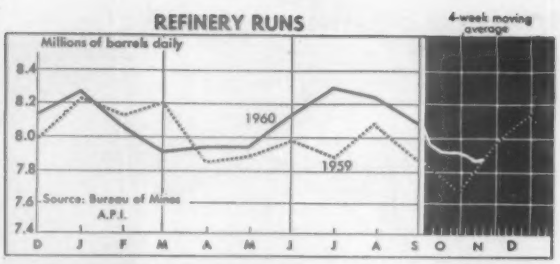

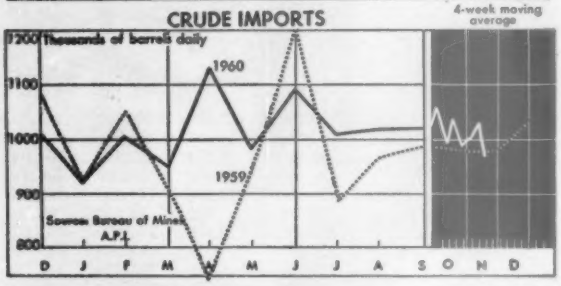

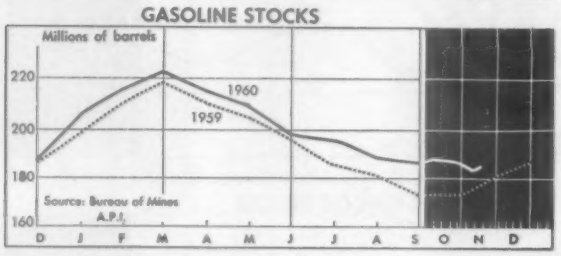

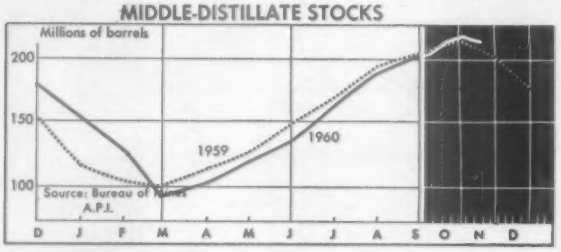

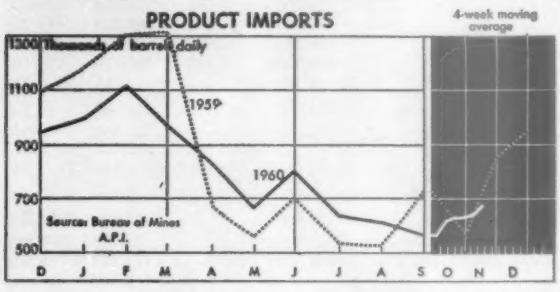

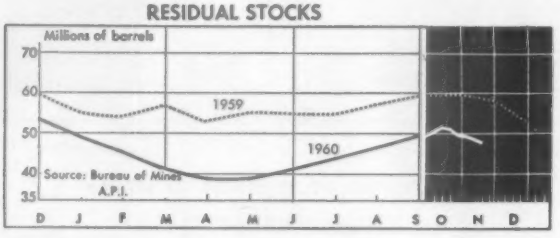

API REFINERY REPORT—NOVEMBER 18, 1960
(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, November 1959 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,114	507.3	53.6	359.3	137.1	45,563	15,300	70,643	13,602	1,141	515.8	36.4	340.1	155.2
Appalachian:														
District 1	97	38.7	5.6	20.0	12.9	5,561	783	4,501	465	93	39.0	3.6	20.9	12.2
District 2	104	53.6	6.3	19.6	13.0	2,830	457	1,707	235	92	53.2	5.3	19.3	14.4
Ind., Ill., Ky. ..	1,439	742.1	83.6	337.0	163.4	29,040	7,443	31,180	6,513	1,464	758.6	78.5	323.1	195.3
Minn., Wis., Dak.	119	59.6	4.0	26.6	18.0	6,613	1,617	8,688	662	113	56.2	5.5	26.8	20.0
Okla., Kans., Mo.	706	418.9	7.8	187.8	21.3	15,182	1,532	14,082	943	695	372.8	14.5	187.6	28.3
Inland Texas ..	274	207.7	8.3	43.3	14.9	6,563	604	1,622	2,586	291	214.4	11.2	48.2	19.5
Texas Gulf Coast	1,866	951.6	157.3	447.8	126.4	25,803	3,583	17,377	5,681	1,827	935.2	109.6	450.9	142.0
La. Gulf Coast.	654	359.6	81.0	133.9	35.7	10,625	2,451	6,024	1,394	714	376.6	57.7	165.6	49.1
N. La. and Ark..	103	62.7	7.4	19.7	3.4	4,840	1,081	2,612	142	75	34.8	2.7	19.1	6.6
Rocky Mountain:														
New Mexico ..	20	10.1	0.6	3.3	3.1	770	45	137	13	26	15.2	0.5	4.9	3.1
Other	280	142.7	4.4	57.3	34.0	5,288	373	3,038	1,073	292	137.8	4.0	64.7	36.7
West Coast	1,211	474.7	47.1	221.3	279.4	25,993	1,564	13,716	14,654	1,161	552.2	3.6	163.6	289.2
Nov. 18, 1960.	7,987	4,029.3	467.0	1,876.9	862.6	184,671	36,833	175,327	47,963	7,984	4,061.8	333.1	1,834.8	971.6
Nov. 11, 1960.	7,717	3,864.4	405.1	1,816.9	770.4	183,062	36,229	179,154	48,724	.....	.....	.....	.....	.....
Nov. 20, 1959.	8,017	4,116.6	316.1	1,794.4	962.1	177,260	31,970	174,571	56,292	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28,9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	$4.75-4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Buckeye Grade	4.08
Illinois Basin	**3.00-3.05**

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0-35.9°, Fao	1.72
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41.0°-41.9°, Umm Said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumbarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

Gulf-N. Y., clean (ATRS – 22.5%)	$2.21
Gulf-N. Y., dirty (ATRS – 35%)	1.85
Carib.-N. Y., dirty (ATRS – 45%)	1.24
PG-N. Y., dirty (USMC – 55%)	5.72

★Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):	
Regular (91 octane)	12.25-12.50
Premium (99 octane)	15.00-15.25
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00
Regular (92 octane)	11.25
Premium (98 octane)	12.25
California (rack) Los Angeles:	
Regular (88 octane)	11.65-12.15
Premium (94 octane)	12.65-13.15
Premium (100 octane)	14.00-14.65
Caribbean area (cargoes):	
Regular (87 octane)	10.125-10.25
Premium (97 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):	
Kerosine 42-44	10.375
Diesel oil (58 d.i. and above)	10.00
Distillate No. 1	10.00
Distillate No. 2	9.00
Gulf Coast (cargoes):	
Kerosine 41-43	9.00- 9.25
Distillate No. 2	8.25
New York Harbor (barges):	
Kerosine 41-43	10.05-10.15
Distillate No. 2	9.05- 9-15
Diesel fuel, 48-52 d.i.	9.35
Caribbean area (cargoes):	
Distillate No. 2	8.125

Residual Fuel (Bbl.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.90
Gulf Coast (cargoes):	
Bunker C fuel	2.30
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
Bunker C	2.10
California (rack):	
Bunker C fuel, Los Angeles	2.25

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80 HORSEPOWER REDA Pump, Motor, Protector, Pump. Switchboard, Accessories 160 horsepower Reda Pump Motor. Protector, Pump. Switchboard, Transformer, Cable, complete. Anchor Oil Company, 461 Cameron Building, JA 4-6112, Oklahoma City, Oklahoma.

40,000'—5½" Casing, 17#, 11½ thrd., smls., electric weld. 50,000'—3" Tubing, 9.2#, 11½ thrd., smls., electric weld. All used in A-1 Condition. Priced for quick sale. The Tri-State Pipe Company, P. O. Box 542, Bellaire, Ohio, Telephone: OR 6-1451.

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28 L SPUDDER, third leg. A-One shape, with or without tools, in West Virginia. Box M-164, The Oil and Gas Journal, Tulsa, Oklahoma.

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SALE

17—ABSORBERS, STILLS, CONTACTORS—8 to 24 trays—50# to 1,800# WP

8—SEPARATORS—480# to 1,500# WP

14—ASSORTED ACCUMULATORS, FEED TANKS, ETC.—50# to 387# WP

130—ATMOSPHERIC CONDENSERS—80 to 722 sq. ft. per unit—125# to 2,500# WP

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1—I.R.	XVG.	6½" x	12"	500# W.P.
12—Clark	MA	7½" x	8¼"	500# W.P.
6—Clark	MA	4½" x	8¼"	900# W.P.

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20,000 FEET OF 3½" IF 13.30# Grade E Bottle Neck Drill Pipe with tool joints 4¾" OD. 15,000 feet of 2⅞" IF 10.40# Grade E Square Shoulder Drill Pipe with tool joints 4⅛" OD. Desco, Inc., Oklahoma City, Oklahoma, Box 4423 Phone OR 7-4949.

DRILLING MACHINE for sale: 80 Keystone same as new, drilled four wells. Too large for this section. Has 4,500 new line; rubber mounted hitch for moving. All steel, roller bearings. Good tailing and drilling to 5,000 ft. $5,000.00. Best Bargain of year. Harold Hardwick, Burnside, Kentucky.

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CORE DRILL operators. We purchased Government Surplus core drilling equipment. Will offer at big money-saving prices. Contact—Pressey & Son, Pueblo, Colo.

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WILL TRADE 9¼" bore x 13" stroke Worthington gas compressor cylinder for 12" bore x 13" stroke in good working condition. Also need 10⅜" liner for same. Box M-177, The Oil and Gas Journal, Tulsa, Oklahoma.

Immediate need of equipment for air drilling conversion of cable tool rig.
Hydraulic Head Rotary Unit—for drill pipe.
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Ingersoll Rand or equivalent Down-hole drills 6" and 4¼"— with 9", 6½" and 5" bits.
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Hydraulic Leveling Jacks.

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1836 Euclid Avenue
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To age 35 for drilling and completions for Independent operating from New Mexico to Canada. Requirements: B.S. degree and five years field experience. Submit resume, state salary required and family status; photograph helpful. Box 22103 Wellshire Station, Denver 22, Colorado.

TRANSLATORS—ENGINEERS WANTED. Proven ability to translate technical material into fluent English essential. Attractive full time or free-lance arrangement. All languages of interest, particularly Russian. Send resume to: A•T•S, Inc., Drawer 271, East Orange, N. J.

REFINERY FOREMAN

Outstanding opportunity as general foreman for man age 30-45 with supervisory experience in catalytic cracking unit. Some college helpful, but not required. Midwest location. Excellent salary and benefits. Our employees know of this advertisement. Send confidential reply to:

Box M-179, The Oil and Gas Journal
Tulsa, Oklahoma

MANAGER, DESIGN ENGINEERING

Large midwestern natural gas company will employ a graduate, professional engineer for this position. He must have at least 10-15 years' experience in compressor, process and pipeline design. 3-5 years' fully responsible supervision of such work is required.
This is an excellent opportunity for rewarding work and personal development. Stock purchase, pension and other employee benefit plans are excellent. Age limit 45. Send your complete, detailed resume, including salary requirements.

Box M-166
The Oil and Gas Journal
Tulsa, Oklahoma

HELP WANTED

OIL JOB DIRECTORY, foreign and domestic, showing where to apply for jobs. Nationwide, $5.00 cash OIML Co., Box 2603, Tulsa, Oklahoma.

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1-5 years experience in process design or technical service within the petroleum or petro-chemical fields.

Excellent opportunity for position with responsibility and diversification with a small progressive company.

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This is a high level job for a man who will be elected an officer of our oil producing company. About one-half of your time will be needed to call on the people who invest in our properties. The other one-half in supervising the drilling, completion and operation of the properties. Previous experience selling and promoting deals helpful in first job and petroleum engineering helpful in second job. Minimum age is 38.

Replies held confidential.

Box M-184, The Oil and Gas Journal
Tulsa, Oklahoma

PROCESS ENGINEERS

Large chemical processing company invites qualified chemical, mechanical or metallurgical engineers to join our expanding engineering staff.

Qualifications should include B.S. or M.S. degree and 1 to 5 years experience in process engineering as associated with process and/or refining industries.

Permanent positions are available at our plant in Boron, California. Salary open with excellent fringe benefits. Relocation expenses paid.

For personal interview send general resume of education and experience to:

Personnel Manager
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630 Shatto Pl., Los Angeles 5, Calif.

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Two openings—up to five years general, corporate, tax or financing experience desired but not necessary for both positions.

Salary Open

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Send complete resume and recent snapshot to:

Assistant to the President
Husky Oil Company
Box 380, Cody, Wyoming

SITUATIONS WANTED

GRADUATE PETROLEUM Engineer, age 40, 15 years of management experience, seeks position in management or sales engineering, either domestic or foreign. References and resumes furnished on request. Box 31R927, The Oil & Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif.

SITUATIONS WANTED

REFINING, SUPERVISORY or operating position. Desires, foreign and short term assignments considered, by experienced chemical engineer: Box M-161, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 10 years exploration South Louisiana, Texas Gulf Coast. Aggressive; excellent record; best references. Executive experience, age 37, married. Box M-182, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPERVISOR, five years production supervisor off-shore operations in Venezuela. Seven years field foreman with major in New Mexico. Two years tool pusher and production foreman with independent in Texas. Wide experience in well completions, drilling and producing operations. Will relocate. Tom Holden, 1734 Briarwood, Abilene, Texas.

GEOLOGICAL-GEOPHYSICAL Engineer, M.S. from the world's foremost school of mineral engineering; Ten years with Major Oil Co.; Three years electronic computors; Wish to locate in Tulsa or Denver; Age 36. Will consider research but prefer staff or administrative work. Box M-176, The Oil and Gas Journal, Tulsa, Oklahoma.

YEARS OF experience in Drilling with Major Oil Co. and Contractors in Africa, Middle-East, France, age under 40. Married, positions held: Driller, Tool Pusher, Superintendent. Speak and write fluently, English and French. Good background, will consider a job with foreign government or oil company. Could be free from my actual position around new year. Write to: Number E 4,490, Contesse & Cie, 20 Avenue De L'Opera, Paris 1, France.

GEOLOGIST, 32, M.S., 7 years stratigraphic, structural, subsurface, wellsite, and surface experience. Rocky Mountains and South Louisiana. Full resume on request, personal interview welcomed. Box M-172, The Oil and Gas Journal, Tulsa, Oklahoma.

Drilling Superintendent, 12 years supervisory experience, drilling, well completion, workover. Box M-167, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 12 years with proven ability and experience in exploration in the southwest and southeastern provinces. Desire challenging opportunity with independent or smaller company. Box M-171, The Oil and Gas Journal, Tulsa, Oklahoma.

SAFETY ENGINEER and Metal Inspector. 13 years experience. Presently handling three refineries. Age 36. Box M-169, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM engineer, 40, 15 years diversified experience with major on Gulf Coast. Desire change to aggressive independent. Will relocate. Box M-175, The Oil and Gas Journal, Tulsa, Okla.

PETROLEUM ENGINEER: age 33, 7 years varied experience in drilling, workovers, production and reservoir studies. Seeks a position as a petroleum engineer or a sales engineer. Box M-174, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST. BS, 38, married. Twelve years varied subsurface and surface major company exploration experience in Texas and New Mexico. Strong business economic, and reserves background. Now employed, Gulf Coast. Seeks change to utilize business-geological background. Resume. Box M-163, The Oil and Gas Journal, Tulsa, Oklahoma.

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HAVE THOUSANDS of acres in Ohio and W. Va. close to Big Play, to farm out. We have a very competant Land Department Will take leases on your lease form. David W. Law, 716 Union Trust Building, Parkersburg, W. Va. Phone: HU 5-6446.

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WATER FLOOD, 7 stripper wells, next to successful flood Crawford Co., Illinois. 950 feet, 200 acres. Box M-170, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Farmouts, drilling deals, leases in Georgia, Florida, and Kentucky. Substantial acreage required. No promotions. Box M-178, The Oil and Gas Journal, Tulsa, Oklahoma.

⅛ WORKING INTEREST in six producing wells, one year old, in Southeast Kansas, in Chautauqua County. Must sell to settle estate. Call TW 2-8736 nights, or write: G. F. Shepherd, 840 Edson Drive, Beaumont, Texas.

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FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition dirict or thru your attorney to Consultant 817—51st Street, Brookiyn, N. Y.

CAPITAL WANTED

GEOLOGISTS AND PARTNERS wish to contact individuals desiring to participate in a wonderful, shallow prospect. Box 12245, Milco Supply Co., Ft. Worth, Texas.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that one parcel of land totaling 200 acres, within the known geologic structure of the Clareton field, Weston County, Wyoming, is offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, January 18, 1961, when bids will be opened. Full details of the offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Arvin H. Olswold, Chief, Minerals Section.

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Home-Pacific 16-29 Knappen, LSD 16, 29-1-11w4. Potential gas discovery. TD 5,967 ft.

British Columbia:

Pacific - Sunray - Imperial b-44-E East Laprise, b-44-E-94-H-5. Triassic gas discovery. TD 4,265 ft.

Saskatchewan:

Central Del Rio 10-34 Parkman, LSD 10, 34-8-33w1. Tilston oil discovery. TD 3,575 ft.

NEW MEXICO

Lea County:

El Paso Natural Gas Co. 1 Lusk Deep unit, 49 miles west of Hobbs in 19-19s-32e, ½ mile northeast of Lusk-Delaware field. IPF 141 BOPD, 7/64-in. choke, 39°, GOR 1,341:1, TP 900-35 psi., packer, Bone Spring 8,759-77 ft.; IPF 732 BOPD, ¼-in. choke, Strawn 11,168-93 ft., 50.1°, GOR 2,640:1, TP 2,345 psi., packer. TD 11,232 ft. PBTD 11,214 ft. Dual oil discovery.

EAST TEXAS

Rusk County:

Hunt Graham and E. L. Howard 1 Sam Mims et al., Jose A. Mora Sur., A-516, 4 miles west of Pine Hill. IP 43 BOPD, 10/64-in., 41.3°, GOR 444 cu. ft. per bbl., TP 200 psi., perf. 7,247 ft., Travis Peak. TD 7,415 ft. New-field discovery. Old hole reworked. Formerly dry.

SOUTHWEST TEXAS

Hidalgo County:

Shell Oil Co. 2 Hale Schaleben et al., Los Indios Tract 9, San Salvador del Tule Grant, A-290. AOF 1,560 M.c.f.d., GLR 81.1 M.c.f per bbl, 44°, shut-in TP 6,240 psi, perf. 10,091-10,106 ft, Vicksburg. TD 11,520 ft. New pay in Los Indios field.

Jim Wells County:

Appell Petroleum Corp. 2 Knox Gas unit, LaVaca Grant, A-166, 6 miles southwest of Alice. AOF 40 M.M.c.f.d., dry gas, shut-in TP 1,466 psi., perf. 3,413-18 ft., Frio. TD 5,525 ft. New pay in Tsesmelis field.

Rand Morgan 11-R Fee, Sec. 5, Ragland Farm Tracts, 5 miles southeast of Orange Grove. Shut-in gas well, no gage. TD 5,816 ft. Extension discovery Rand Morgan field.

Starr County:

George and Douglas Weatherston 3 La Brisa Land & Cattle Co., Share 215, Porcion 90, 10 miles northeast of Rio Grande City. AOF 890 M.c.f.d., dry gas, shut-in pressure 958 psi., perf 2,491-97 ft., Frio. TD 2,606 ft. New pay in West Boyle field.

TEXAS GULF COAST

Calhoun County:

Humble Oil & Refining Co. 1 Appling Gas unit 4, Sec. 42, Theodore F. Koch Subd., James Hughson Sur., A-23, 7 miles northeast of Olivia. AOF 17 M.M.c.f.d., 28.5 BC per M.M.c.f., 51.6°, shut-in TP 5,216 psi., perf. 8,238-58 ft., Frio. TD 8,815 ft. New pay in Southeast Appling field.

Chambers County:

Ralph Lowe and Frank W. Michaux 1 Grover C. Wilcox, Andrew Weaver Sur., A-311, 2 miles north of Hankamer. IP 144 BOPD, 9/64-in., 30°, GOR 200 cu. ft. per bbl., TP 775 psi., perf. 5,248-

54 ft., Marginuline-Frio. TD 6,757 ft. New fault-block and extension discovery for Southeast Hankamer field.

Texaco, Inc. 1 O. H. Acom, HT&B Sur. 115, A-147, 6 miles southwest of Stowell. AOF 5,800 M.c.f.d., GLR 255 M.c.f. per bbl., 50.4°, shut-in TP 2,622 psi.. perf. 8,401-5 ft. and 8,410-13 ft., Frio. TD 11,000 ft. Discovery well of Acom (proposed) field, 1 mile east of Willow Slough field.

Lee County:

Union Producing Co. 1 Preuss, John Vashary Sur.. A-329, 1¼ miles south of Giddings. IP 313.21 BOPD, ¼-in., 39.8°, GOR 735 cu. ft. per bbl., TP 500 psi., perf. 8,100-10 ft. and 8,118-8,204 ft., Austin Chalk. TD 12,246 ft. Discovery well of Giddings field.

Matagorda County:

Kirby Petroleum Co 1 Reinke Estate, John Martin Sur., A-357, 3 miles southeast of Bay City. AOF 18,500 M.c.f.d., GLR 15,037 cu. ft. per bbl., 54°, shut-in TP 6,025 psi., perf. 11,272-84 ft., 11,264-70 ft., and 11,257-61 ft., lower Frio. TD 11,350 ft.. New pay in East Hamman field.

Ohio Oil Co. 1-A Stanley Kubela, Blk. 95, J. C. Hall Sur., A-197, 4 miles northeast of Collegeport. IP 186.03 BOPD, 15/64-in., 37.7°, GOR 997 cu. ft. per bbl., TP 350 psi., perf. 8,955-63 ft., Frio. TD 9,150 ft. New pay in Palacios field.

Orange County:

Texas Gulf Producing Co., Texas Pacific Coal & Oil Co., and A. H. and C. L. Rowan 1 Claybar & Lindsey, GC&SF Sur. 10, A-477, 3 miles west of Hartburg. AOF 8,700 M.c.f.d., GLR 44.3 M.c.f. per bbl., 49.4°, shut-in TP 4,817 psi., perf. 7,762-68 ft., Frio. TD 8,481 ft. New-reservoir discovery 1½ miles north of South Hartburg field.

Refugio County:

Vernor Oil & Gas Co. 2 Winifred Shaw, Sec. 36½, Bonnie View Ranch Subd., Antonio de la Vina Grant, A-71, 2 miles southeast of Woodsboro. AOF 16 M.M.c.f.d., dry gas, shut-in pressure 1,102 psi., perf. 2,904-5 ft., Miocene. TD 2,950 ft. New pay in North La Rosa field.

Wharton County:

Acco Oil & Gas Co. 1 Norris Raun, Mary Montgomery Sur. 2, A-627, 10 miles northwest of El Campo. AOF 4,200 M.c.f.d., dry gas, shut-in TP 1,620 psi., perf. 4,252-56 ft., Frio, and 2,800 M.c.f.d., dry gas, 1,590 ft., perf. 4,059-66 ft., Frio. TD 5,060 ft. Discovery well of Golden Rod (proposed) field.

Houston Natural Gas Producing Co. 1 Ella Wigginton et al., ETRR Sur. 89, A-98, 8 miles southeast of El Campo. IP 163.64 BOPD, 8/64-in., 44.2°, TP 1,275 psi., perf. 7,547-52 ft., Frio. TD 7,841 ft. Discovery well of Etta (proposed) field.

Otis Russell 1 Anna Shult et al., IRR Sur. 1, A-257, 8 miles west of El Campo. AOF 160 M.M.c.f.d., dry gas, shut-in pressure 1,616 psi., perf. 4,614-16 ft., upper Frio. TD 5,957 ft. New-reservoir discovery in El Campo area.

WEST TEXAS

Irion County:

Sinclair Oil & Gas Co. 1 Harry Lindley, 3½ miles southwest of Mertzon in Sec. 59, Blk. 1, H&TC Sur., 2 miles northeast of Mertzon field. IPP 55 BOPD, plus 29% water, 38.5°, GOR 145:1. Clearfork 3,276-79 and 3,281-84 ft. TD 3,800 ft. PBTD 3,354 ft. New oil field.

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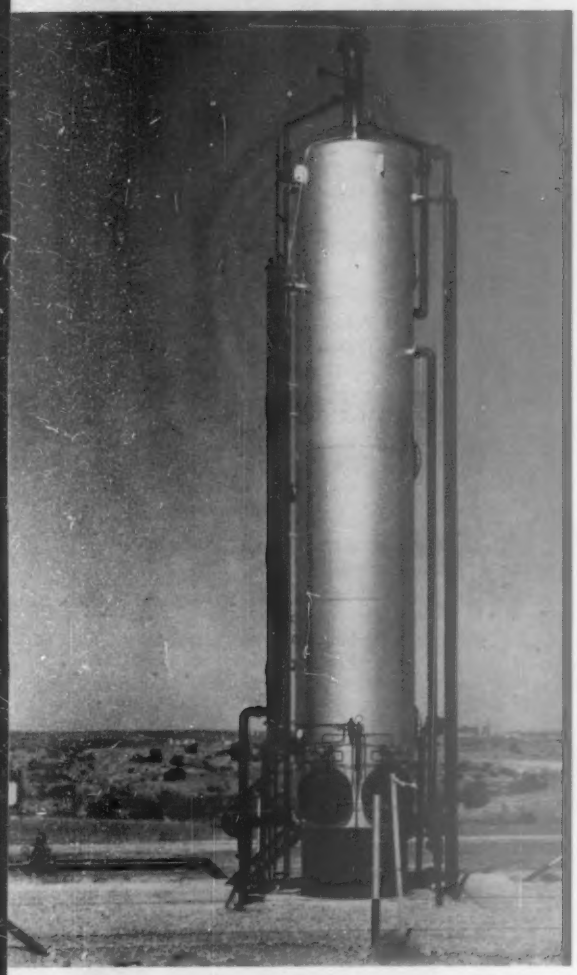

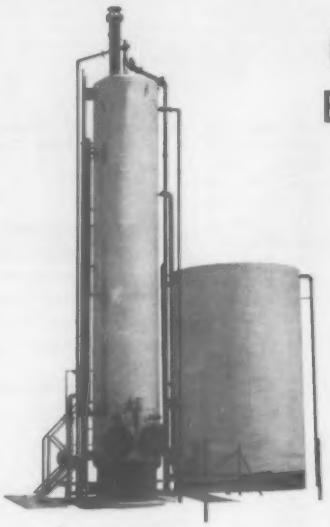

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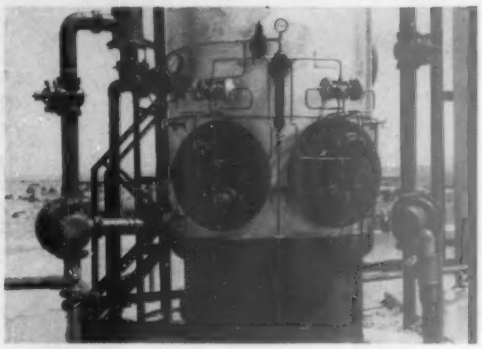

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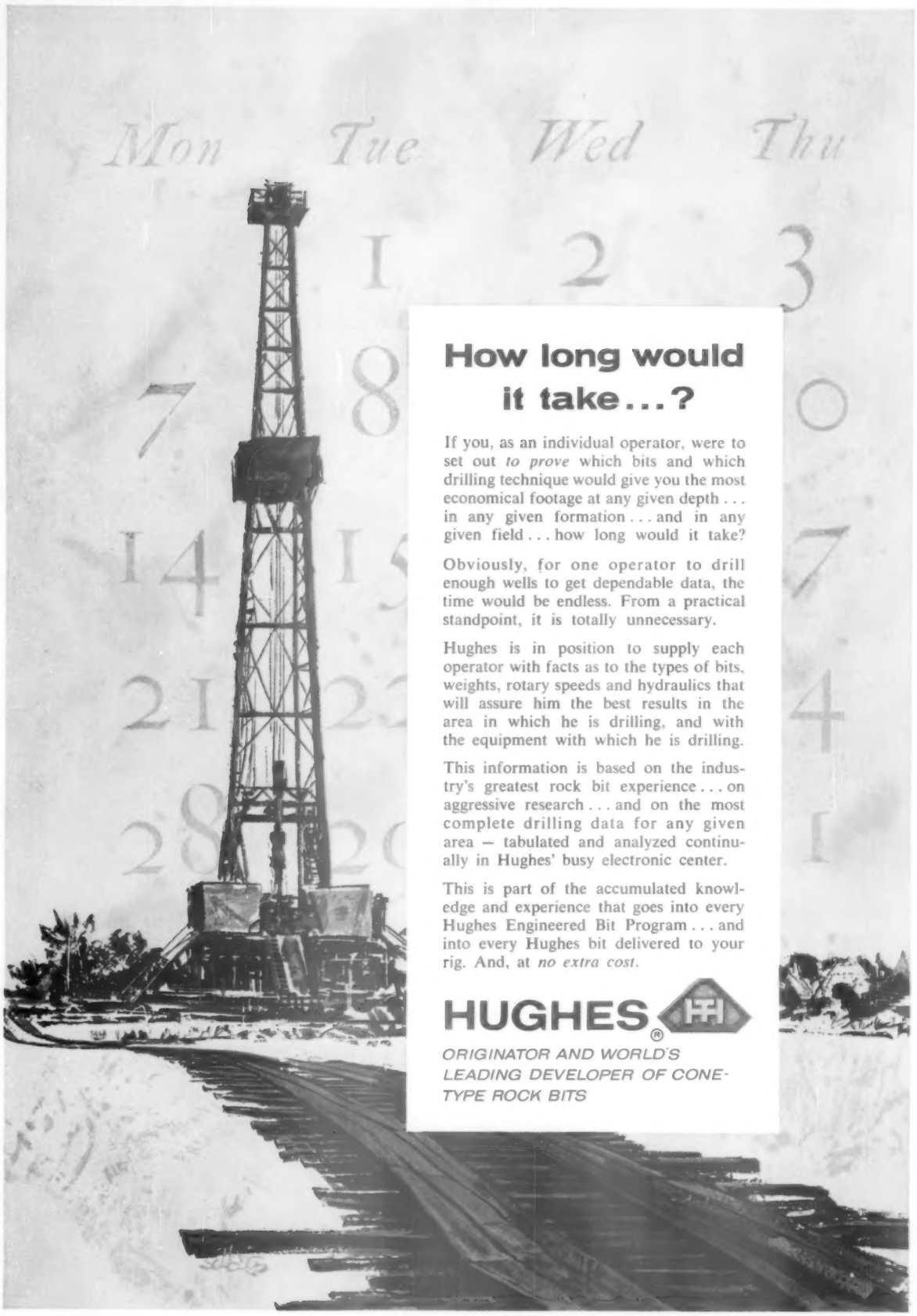

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